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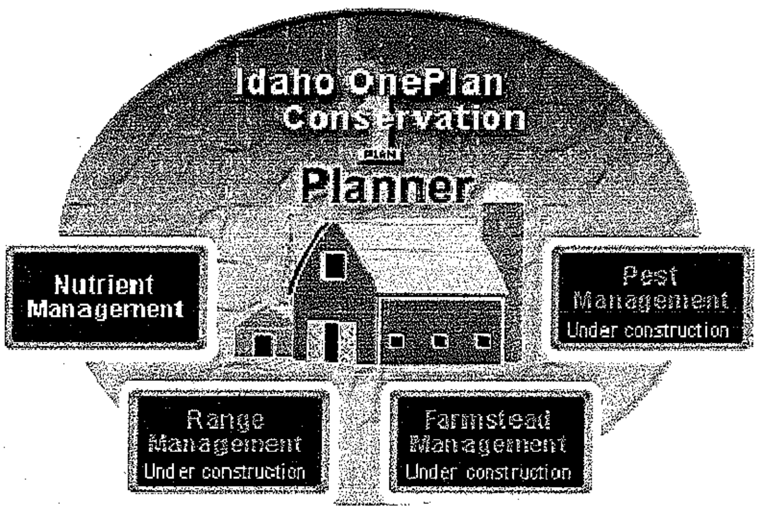
Treasure Valley Land & Livestock

Nutrient Management Plan

Agriculture . . .
Launching into the Future



Nutrient Management Plan Prepared For:
Terry Jones
[redacted]
Treasure Valley Land & Livestock

Certified Planner:
Allen Giacomini
Certified/Dairy Inspector, Idaho State Department of Agriculture
(208) 850-8486

Producer Signature: ______________ Certificated Planner Signature: ______________
Date Completed: 3-16-07

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PRODUCER SUMMARY

Facility Summary

Treasure Valley Land and Livestock is an existing dairy facility owned and operated by Terry Jones and is located at 5888 Sandy Ave in Emmett Idaho T.7N, R.3W, Sec 12. This Nutrient Management Plan has been written for 300 mature dairy cows even though it is starting out with considerably less. All livestock is housed in open lots and bedded with long straw during the winter months. This facility has 183 farmable acres available using mostly a corn/alfalfa crop rotation. All wastewater can be land applied through gated pipe and hand and wheel lines. As the facility increases in size with animal units, solids may need to be exported to a third party. Wastewater from the milking barn is gravity fed to the liquid waste storage pond. This facility is properly sized and has sufficient containment for 180 days of storage. This Nutrient Management Plan is a working document and will be upgraded as the facility operation changes or expands.

Resource Concerns

Treasure Valley Land and Livestock is located in the 17050122 hydraulic unit in the Payette watershed basin. This stream segment is water quiality limited because of a water quality parameter preventing the attainment of the "Fishable/Swimable goal of the Clean Water Act. Resource concern for this dairy would be surface water. Most of the fields are surface irrigated with gated pipe and all runoff is contained on the property.

Manure Application Rate Requirement By Year

FIELD: 1 / Owl 12 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93

		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 2 / Rabbit 11 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 3 / Cottonwood 27 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92

		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 5 / Pheasant 14 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		0 T/ac	41 %				
		N	0	31	N	0	N	31
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		0 T/ac	41 %				
		N	0	31	N	7	N	38
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		0 T/ac	41 %				
		N	0	31	N	7	N	38
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183

FIELD: 6 / Skunk 34 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		13 T/ac	59 %				
		N	26	18	N	0	N	44
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		12 T/ac	59 %				
		N	26	18	N	14	N	58
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		12 T/ac	59 %				

		N	26	18	N	14	N	58
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189

FIELD: 7 / Snake 43 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Wheat, Spring, S-ID, Irrigated(2006)	Y		22 T/ac	0 %				
		N	44	0	N	45	N	89
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2007)	Y		21 T/ac	0 %				
		N	44	0	N	64	N	108
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2008)	Y		21 T/ac	0 %				
		N	44	0	N	54	N	98
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2009)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2010)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2011)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2012)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149

FIELD: 8a / Upper Turkey 20 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization	Total

Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2006)	Y		17 T/ac	0 %				
		N	33	0	N	0	N	33
		P	52	0			P	52
		K	112	0			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2007)	Y		15 T/ac	0 %				
		N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2008)	Y		15 T/ac	0 %				
		N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2009)	Y		15 T/ac	0 %				
		N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		15 T/ac	0 %				
		N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2011)	Y		15 T/ac	0 %				
		N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112

FIELD: 8b / Lower Turkey 13 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		17 T/ac				
		N	33	N	0	N	33
		P	52			P	52
		K	112			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2007)	Y		15 T/ac				
		N	33	N	8	N	41
		P	52			P	52
		K	112			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2008)	Y		15 T/ac				
		N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2009)	Y		15 T/ac				
		N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2010)	Y		15 T/ac				
		N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		15 T/ac				
		N	33	N	18	N	51
		P	52			P	52
		K	112			K	112

FIELD: 9 / Bull 9 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

Minimum Acres Required for Manure Application

Manure Group	Acres
Solid Stack(s)	226
Waste Storage Pond(s)	31

The acreage in the table is based on an average crop uptake of 100 lbs P_2O_5 per acre. These acreage numbers are for estimating export acreage needed.

Hydraulic Balance

Wastewater applications should begin and end with the irrigation season. Depending on weather and soil conditions, applications outside of this window may be allowed. Lagoons must be emptied in the fall. Fall application of effluent must be completed prior to November 15th. No application will be allowed to frozen or snow covered ground. Spring applications prior to the start of the irrigation season may be allowed if moisture or nutrients are needed to enhance crop production. You must contact the Department of Agriculture, Dairy Bureau (208) 332-8550 prior to any wastewater application outside of the irrigation season. The need for wastewater application outside of the irrigation season will be evaluated on a case by case basis. Factors considered in granting approval will be but are not limited to the following; date, existing and forecasted weather conditions, moisture content of the soil, water holding capacity of the soil, frost layers in the soil, and crop needs.

Annual Soil Test

Annual soils tests must be taken every year from every field to determine a commercial fertilization rate. If commercial fertilizer isn't applied (for a perennial crop), annual soil samples are not required. If you do not apply commercial fertilizer, a complete soil analysis will need to be conducted initially to determine the nutrient baseline.

Record Keeping

For each field keep a record of annual manure and chemical fertilizer applications. Include nutrient source, date, time, rate and application method. Records must also be kept on exported manure. These records should include the name of the person receiving the manure, source, and quantity of the manure, and the export date.

Facility Testing Requirements

Regulatory soil samples will be required from each field every three to five years. These samples must be taken from 18-24" for fields listed as a groundwater concern and from 0-12" for fields listed as surface water concern.

Recommendations for Best Management Practices

No Data

Treasure Valley Land & Livestock
ANALYSIS OF RESOURCE CONCERNS

INTRODUCTION

The purpose of this nutrient management plan is to meet agricultural production goals and to certify that manure and nutrients are properly managed to minimize adverse impact to surface or groundwater. Plans are written in cooperation with the producer to:

1) Assure proper containment of animal manure and process waste water.

2) Assess resource concerns which exist on the property.

3) Budget nutrient sources to optimize crop water and nutrient needs. Nutrient sources include commercial fertilizers, animal manure, mineralization of previous crop soil organic matter, accounting of residues, and irrigation water.

4) When applicable, assess irrigation water management to minimize movement of nutrients beyond the root zone or with runoff.

If animal manure and/or commercial fertilizers are not properly managed, contaminants may negatively impact surface and/or groundwater. Some water resource contaminants associated with poorly managed animal manure and fertilizers are:

Phosphorus in the soil readily adsorbs to soil particles; thus, erosion of soil by surface runoff is the general mode of phosphorus transport. Even at very low concentrations, phosphorus can result in plant and algae blooms in surface water bodies. Alga blooms are a nuisance to boaters, irrigators, and others. Toxins released by certain algae can be lethal to livestock or other animals that drink the water. Dissolved oxygen in the water is depleted as algae die and decompose, sometimes causing fish kills.

Nitrogen in the form of nitrate (NO_3^-) is highly water-soluble and will move with water, particularly down the soil profile past the root zone if not utilized by plants (thus becoming a groundwater contamination issue).Nitrates are toxic to infants under 6 months, and to livestock at high concentrations. In surface water, excess nitrogen, like phosphorus, can result in nuisance plant and algae growth.

Organic matter in high load decreases dissolved oxygen in a surface water body when it decomposes. Low levels of dissolved oxygen is harmful or even fatal to fish and other aquatic life.

Bacteria and microorganism illnesses (pathogens) potentially transmitted through water by animal manure include Giardia, Typhoid Fever, Cryptosporidium, and Cholera. Pathogens from animal waste can negatively impact surface and groundwater quality.

FACILITY DESCRIPTION

Owner Information

Owner (1): Terry Jones
Address: 5888 Sandy Ave, Emmett, ID
Phone: [redacted]

Location

Site Map: Facility site plan illustrated in Figure 1

Soil Conservation District:	Gem
County:	Gem
Watershed Basin:	Payette (USGS Hydrologic Unit Code #

17050122)

ANALYSIS OF RESOURCE CONCERNS

Farm Resource Concerns

Treasure Valley Land & Livestock is located in a watershed containing water quality limited stream segments listed according to the Clean Water Act. Stream segments are listed because a water quality parameter prevents the attainment of the "Fishable/Swimmable" goal of the Clean Water Act.

WATERBODY	BOUNDARIES	BACT	CHAN STAB	DO	FLOW ALT	HAB ALT	MET HG	MET	NH3	NUTR	O_G	ORG	PEST	PH	SAL	SED	TDG	TEMP	UNKN	*
Big Willow Cre	Rock Creek to Payette River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	☐
Bissel Creek	Headwaters to Payette River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	☐
Black Canyon R	N/A	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	☐
Payette River	Black Canyon Dam to Snake River	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	☑
Soldier Creek	Headwaters to Squaw Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	☐

Treasure Valley Land & Livestock is <u>not</u> located in a critical Nitrate-Nitrogen management area . Nitrate Management Areas are designated based upon ground water quality sampling results. Two priority groups exist as follows:

<u>Priority 1</u> is designated because at least 25% of the ground water sampling locations within the area exceed 5-milligrams/liter nitrate. This is one-half of the maximum contaminant level of 10-milligrams/liter nitrate. This nitrate concentration is considered evidence of significant degradation. Public drinking water systems are required to increase monitoring frequency when this level is reached.

<u>Priority 2</u> is designated because at least 50% of the ground water sampling locations within the area exceed 2-milligrams/liter nitrate. This concentration threshold provides an indication of human-caused (anthropogenic) impacts. The upper limit for naturally occurring (background) concentrations of nitrate is considered to be about 2 mg/l.

Treasure Valley Land & Livestock is located in a sole source aquifer area - Western Snake River Plain Aquifer.

Field Resource Concerns

- No Resource Concerns -

Depth Limiting Subsurface Features

Field Name	Subsurface Feature	Depth from Surface (in)
1 / Owl	Water Table	>72
2 / Rabbit	Cobbles	48
	Hard Pan	20
	Water Table	>72
3 / Cottonwood	Water Table	>72
5 / Pheasant	Water Table	>72
6 / Skunk	Cobbles	48
	Hard Pan	20
	Water Table	>72
7 / Snake	Cobbles	47
	Hard Pan	20
	Water Table	>72
8a / Upper Turkey	Cobbles	48
	Hard Pan	20
	Water Table	>72
8b / Lower Turkey	Cobbles	47
	Hard Pan	20
	Water Table	24
9 / Bull	Water Table	>72

Well Testing Results (See back of page):

Well	Date	Hardness	EC	PH	K	Nitrates	Nitrites	NH3	Na	Carbonate	Bicarbonate
No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

ISDA REGULATIONS AND THE IDAHO NUTRIENT MANAGEMENT STANDARD

Nutrient management plans for animal agricultural operations regulated by the Idaho State Department of Agriculture (ISDA) must be approved by the Idaho State Department of Agriculture and must follow the Natural Resource Conservation Service (NRCS) Agriculture Waste Management Field Handbook and the Idaho Nutrient Management Standard. ISDA regulation and the Standard use soil test phosphorus as the indicator for environmental impact from agricultural production practices. The Idaho Nutrient Management Standard is based on a threshold soil test phosphorus level (TH), above which there is no agronomic advantage to application of phosphorus.

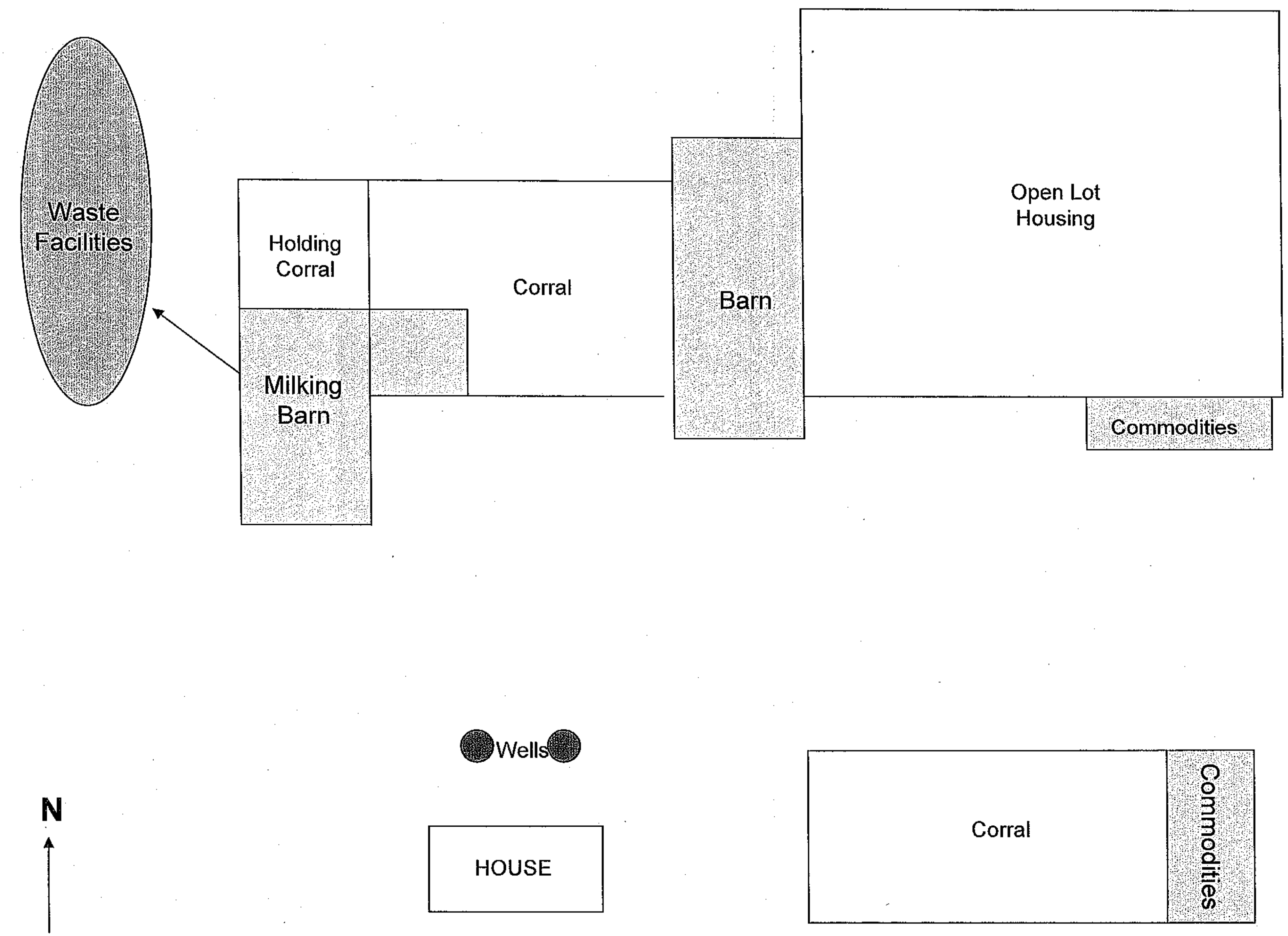
The Idaho Nutrient Management Standard categorizes fields as a surface water concern or a groundwater concern. A surface water concern indicates that runoff leaves the contiguous operating unit from normal storm events, rain on snow, frozen ground, or irrigation. The soil phosphorus threshold for a field with a surface water concern is 40 ppm phosphorus for basic soils (pH > 7) tested with the Olsen method; 60 ppm phosphorus for acidic soils (pH < 7) tested with the Bray method; and 6 ppm phosphorus for acidic soils tested with the Morgan method (0-12"Soil Sample Depth).

A groundwater resource concern indicates that runoff does not leave the contiguous operating unit from normal storm events, rain on snow, frozen ground, or irrigation. There are two sub-categories for fields identified as having a groundwater concern. The first category applies to fields with a resource concern within the first five feet of the soil profile. A resource concern could be shallow soils, gravel, cobble, bedrock, high groundwater table, or a drained field. These fields are indicated as a groundwater concern <5'. The soil phosphorus threshold for a field with a groundwater concern <5' is 20 ppm phosphorus for soils tested with the Olsen method; 25 ppm phosphorus for soils tested with the Bray method and 2.5ppm phosphorus for soils tested with the Morgan method (18-24" Soil Sample Depth).

If a field is not classified as having a surface water concern or a groundwater <5' concern, by default it is classified as having a groundwater concern >5'. The soil phosphorus threshold for a field with a groundwater concern >5' is 30 ppm phosphorus for soils tested with the Olsen method; 45 ppm phosphorus for soils tested with the Bray method; and 4.5 ppm phosphorus for soils tested with the Morgan method (18-24" Soil Sample Depth).

Field Phosphorus Threshold

Field	Resource Concern	P Threshold (ppm)	P Threshold Soil Test Depth
1 / Owl	Surface Water	40	0 - 12"
2 / Rabbit	Surface Water	40	0 - 12"
3 / Cottonwood	Surface Water	40	0 - 12"
5 / Pheasant	Surface Water	40	0 - 12"
6 / Skunk	Surface Water	40	0 - 12"
7 / Snake	Groundwater < 5'	20	18 - 24"
8a / Upper Turkey	Surface Water	40	0 - 12"
8b / Lower Turkey	Surface Water	40	0 - 12"
9 / Bull	Surface Water	40	0 - 12"


Waste
Facilities
Holding
Corral
Milking
Barn
Corral
Barn
Open Lot
Housing
Commodities
Wells
N
HOUSE
Corral
Commodities

Farm Location

Idaho Transverse Mercator

Coordinates of the farm center (meters): X = 2287587.57822047, Y = 1420420.68386378

Map Scale: 1 : 47

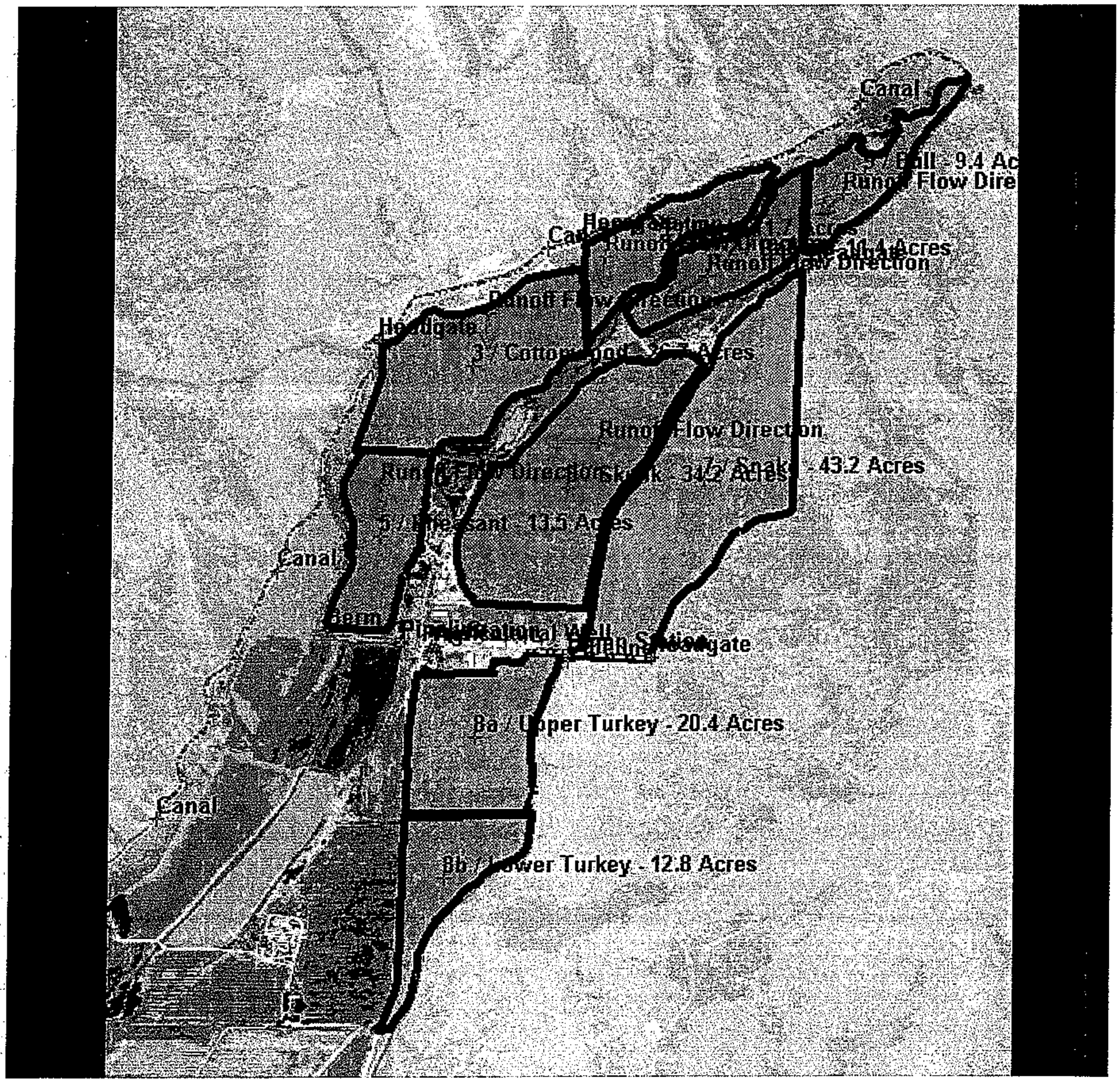


Figure 1. Base Map

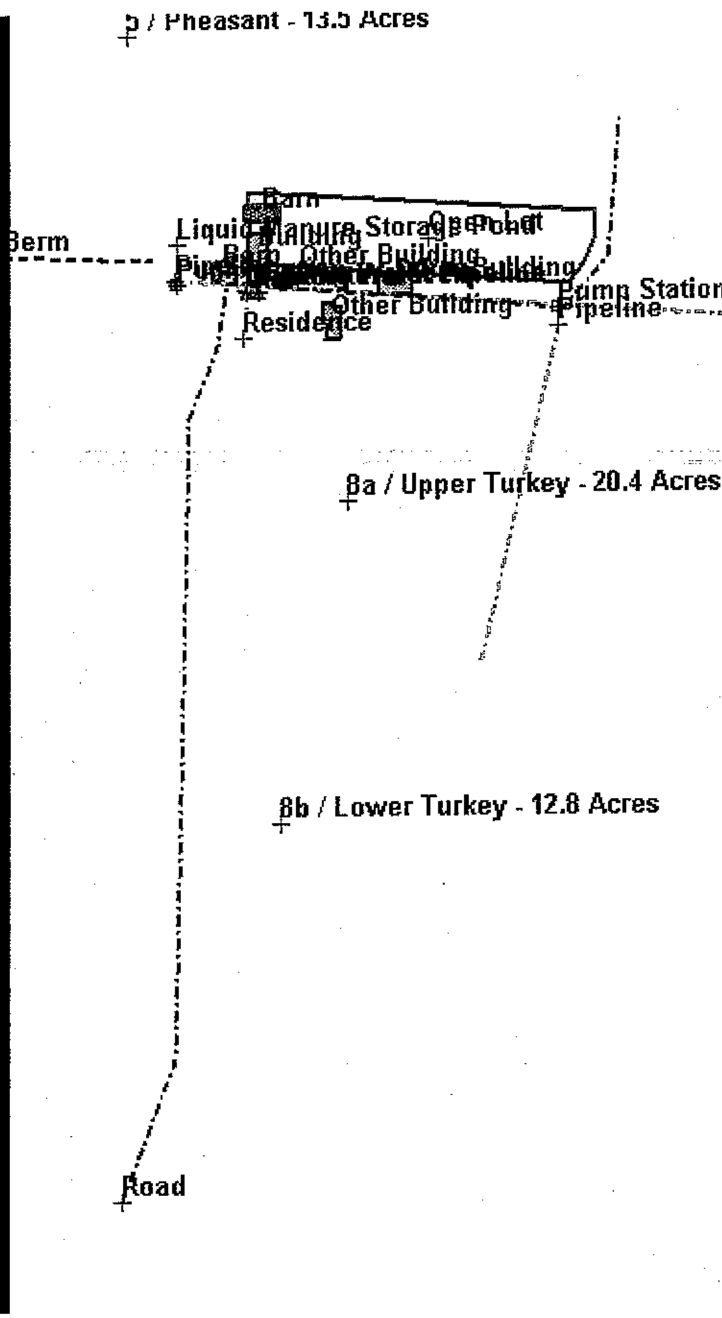
Farm Location

Idaho Transverse Mercator

Coordinates of the farm center (meters): X = 2287587.57822047, Y = 1420420.68386378

Map Scale: 1 : 47

[redacted]



[redacted]

Figure 2. Farmstead Map

ANNUAL NUTRIENT BUDGET

The following crop nutrient budget is based on soil test data and cropping information. It is for one year for the following field and specified crop information:

Nutrient Budget Summary

Field: 1 / Owl **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

Field: 2 / Rabbit **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

Field: 3 / Cottonwood **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 5 / Pheasant **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	17		
from Irrigation Water	0		0
Nutrient Balance from above *	222.8	93.4	213.3
Solid Stack(s)	0	0	0
Waste Storage Pond(s)	31	93	183
Estimated Remaining Nutrients Required *	192	0	30
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	192	0	30

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 6 / Skunk **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		

from Prior Bio-Nutrients	24		
from Irrigation Water	0		0
Nutrient Balance from above *	216.1	93.4	213.3
Solid Stack(s)	26	40	86
Waste Storage Pond(s)	18	53	103
Estimated Remaining Nutrients Required *	172	-1	23
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	172	-1	23

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 7 / Snake **Crop:** Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated **Yield:** 15

	N	P205	K20
Crop Nutrient Requirement	280	91	433
Nutrients From Soil	?		
from Mineralized Nitrogen	45		
from Prior Crops	-5		
from Prior Bio-Nutrients	24		
from Irrigation Water	0		0
Nutrient Balance from above *	215.6	90.7	433.4
Solid Stack(s)	44	70	149
Waste Storage Pond(s)	0	0	0
Estimated Remaining Nutrients Required *	172	21	284
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	172	21	284

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Rate may result in crop nutrient deficit or a potential resource concern.
Acceptable: Sustainable agronomic rate.

Field: 8a / Upper Turkey **Crop:** Alfalfa, Hay, Cut Mature, S-ID, Irrigated **Yield:** 4.6

	N	P205	K20
Crop Nutrient Requirement	183	42	176
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	0		
from Prior Bio-Nutrients	18		
from Irrigation Water	0		0
Nutrient Balance from above *	164.8	42.1	175.5

Solid Stack(s)	33	52	112
Waste Storage Pond(s)	0	0	0
Estimated Remaining Nutrients Required *	132	-10	64
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	132	-10	64

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 8b / Lower Turkey **Crop:** Alfalfa, Hay, Cut Mature, S-ID, Irrigated **Yield:** 4.6

	N	**P205**	**K20**
Crop Nutrient Requirement	183	42	176
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	18		
from Irrigation Water	0		0
Nutrient Balance from above *	174.8	42.1	175.5
Solid Stack(s)	33	52	112
Estimated Remaining Nutrients Required *	142	-10	64
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	142	-10	64

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 9 / Bull **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	**P205**	**K20**
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

ANALYSIS OF ANIMAL SYSTEM

WASTE STORAGE AND HANDLING

Livestock Unit Waste Characteristics

Description	Animal	Number	Average Animal Weight	Days Collected	Housing	Bedding Type	Bedding (tons)	Waste (tons)
Milksers	Lactating Cow	250	1,400	365	Open Lot	Long Straw	594	5,426
Dry's	Dry Cow	50	1,400	365	Open Lot	Long Straw	119	1,104

Manure/Biosolid Groups

Manure Group	Storage Type	Application Method	Days to Incorporation	Nitrogen Retention(%)	Annual Volume (ft3)	Annual Weight (tons)
Solid Stack(s)	Manure and Bedding Held in Unroofed Storage	Broadcast, Incorporated deeper than 3 inches	4-7 days	48	203,771	6,663
Waste Storage Pond(s)	Waste Storage Pond, Diluted > 50%	Irrigation	N/A	26	26,253	814

* in Nitrogen Retention % Column means "Overridden Nitrogen Values"

Manure Group		Dry's	Milksers
Waste Storage Pond(s)	% To Group	N/A	15
Solid Stack(s)	% To Group	100	85

Annual Production of Nutrients

The nutrient values were calculated based on animal weight and nitrogen loss estimates as described in the NRCS Agricultural Waste Management Field Handbook guidelines (1996). The calculations are estimates, and manure testing is recommended for more accuracy, as manure nutrient content varies widely among operations.

Nutrient Distribution on Facility				
	Pounds N	Pounds P_2O_5	Pounds K_2O	% of Total
Total Nutrients Produced	33827	25655	54284	
Solid Stack(s)	31563	22586	48280	90
Waste Storage Pond(s)	2264	3069	6004	10
Nutrients Exported	14546	10978	23342	43
Nutrients Onsite	19281	14677	30942	57

Comments on Bionutrients
No Comments

Dairy Water Values

Dairy Water Values			
Dairy Process Water:	290	**Milk Parlor Cleaning Water:**	400
Dairy Parlor Water:	200	Hose Volume:	400
Bulk Tank Water:	90	Flush Volume:	0
Cow Prep Water:	0	Deck Flush Volume:	0
Automatic Backflush:	0	Other Volume:	0
Sprinkler Volume:	0	**Holding Pen Cleaning Water:**	200
Manual Cow Prep:	0	Hose Volume:	200
Dairy Equipment Water:	3895	Flush Volume:	0
Compressor Water:	0	Other Volume:	0
Vacuum Pump Water:	0	**Freestall/Alley Flush:**	0
Pre-Cooler Water:	3895	**Excess Water**	
Glycol Chiller Water:	0	Cow Water:	7500
Miscellaneous Equipment Water:	120	Group 1:	-3605
Washing Machine Water:	0	Group 2:	600
Miscellaneous Water:	20		
Milkhouse Water	100	**Total Dairy Water:**	**1010**

Bulk Tank(s)		
Bulk Tank ID	Size	Volume
1	5000	180

Comments

Cow Prep Comments:
All cows are pre-dipped with iodone solution and toweled dry. Cows are also post dipped. No water is used for cleaning cows prior to milking.

Holding Pen Comments:
Parlor is washed after each milking. Holding pen is washed once daily.

MANURE STORAGE SUMMARY

Total Annual Liquid Capacity Required				
Bio-Nutrient Group	Recommended Capacity Cubic Feet	% Contained	Storage Days	Storage Vol. Cubic Feet
Waste Storage Pond(s)	26,253	100%	180	12,947
Process Water	49,153	100%	180	24,240

Total Annual Solid Capacity		
Bio-Nutrient Group	Recommended Capacity Cubic Feet	% Contained
Solid Stack(s)	203,771	0%
Milksers	134,129	0%
Dry's	26,871	0%

Existing Storage Containers						
Storage Unit Name	Days Stored	Waste Storage Pond(s)	Solid Stack(s)	ProcessWater	Milksers - Bedding	Dry's - Bedding
Liquid Waste Pond	180	100%	0%	100%	0%	0%

New Storage Containers Required		
Storage Unit Name	Days Stored	No Data
No Data	@[DaysStored]	No Data

Container Name	Volume (ft3)	Storage Period (Days)	Length	Width	Depth	Slope	Diameter	Existing	Proposed
Liquid Waste Pond	385,333.0	180	500.0	100.0	10.0	2.0	0.0	0.0	0.0

Containment of Housing Facility Waste and Corral Runoff

It is important that water from housing facilities and contaminated runoff from corrals be contained and/or diverted to the lagoon storage system. As stated in the Idaho State Department of Agriculture (ISDA) regulation, a discharge is allowed only under large precipitation events (>25yr, 24hr storm event). Lagoon structures must be properly designed, operated, and maintained to contain all barn wastewater and contaminated runoff from a 25-year, 24-hour rainfall event for the site location and maintained to contain all runoff from accumulation of winter precipitation from a one in five-year winter. Animals confined in the CAFO may not have direct contact with canals, streams, lakes, or other surface waters.

Comments

No Comments

BIO-NUTRIENT EXPORT INFO

Exported Bio-Nutrient Summary					
Bio-Nutrient Group Name	**Amount**	**Consumer**	**Consumer's Address**	**Telephone**	**Acres**
Solid Stack(s)	100	Silverleaf Farm	9288 Silverleaf Rd,Emmett,ID,83617		110

ANALYSIS OF CROPPING SYSTEM

Farming Operation

Total Acres: 183.3

Crop Production History

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Corn

Crop	Yield	Yield Units	N Requirement	P_2O_5 uptake	K_2O Requirement
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Average				93	

* Nitrogen and Potassium Requirements assume zero credits.

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Triticale Wheat

Crop	Yield	Yield Units	N Requirement	P_2O_5 uptake	K_2O Requirement
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240
Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240
Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240

Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Average				70	

* Nitrogen and Potassium Requirements assume zero credits.

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Alfalfa Corn

Crop	Yield	Yield Units	N Requirement	P_2O_5 uptake	K_2O Requirement
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Average				52	

* Nitrogen and Potassium Requirements assume zero credits.

Mapped Resource Concern(s)

Field Name	Acres	Resource Concern(s)
No Data	No Data	No Data

ANALYSIS OF IRRIGATION PRACTICES

Irrigation Management

Proper irrigation management depends on factors such as the following.

Irrigation Efficiency: The efficiency with which the irrigation wets the entire crop root zone. This takes losses that occur from evaporation, runoff and deep percolation.

Crop Evapotranspiration Rate (ET): The combined rate at which water from the soil profile is evaporated into the atmosphere and transpired from the crop. The rate is expressed in units of inches/day.

Management Allowable Depletion (MAD): The percentage of water, which can be depleted from the soil before the crop, experiences water deficiency stress.

Available Water Holding Capacity in the Soil (AWH): The amount of water the pores in the soil profile can hold against gravity. The AWH is expressed as inches of water per inch of soil.

Crop Rooting Depth: The depth in the soil profile to which the crop roots can penetrate.

Surface Irrigation Summary

Field Name: 1 / Owl

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	130.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	1.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	.2	320.0	3.3	4.2	95.8
Jul	7.0	24.0	.5	320.0	7.7	4.2	95.8

Aug	7.0	12.0	.9	160.0	6.3	8.2	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 2 / Rabbit

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	1320.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	4.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	2.5	31.5	3.3	16.3	83.3
Jul	7.0	24.0	5.4	31.5	7.7	15.8	83.3
Aug	7.0	24.0	4.4	31.5	6.3	16.0	83.3
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 3 / Cottonwood

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	350.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	.7	118.9	3.3	8.2	91.7
Jul	7.0	24.0	1.4	118.9	7.7	8.2	91.7
Aug	7.0	24.0	1.2	118.9	6.3	8.2	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 5 / Pheasant

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	1000.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	3.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.9	41.6	3.3	12.3	87.5
Jul	7.0	24.0	4.1	41.6	7.7	12.0	87.5
Aug	7.0	24.0	3.4	41.6	6.3	12.1	87.5
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 6 / Skunk

Date of Initial Irrigation:	6/1/2007

Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	800.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.5	52.0	3.3	8.2	91.7
Jul	7.0	24.0	3.3	52.0	7.7	8.0	91.7
Aug	7.0	24.0	2.7	52.0	6.3	8.1	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Hand or Wheel Line Irrigation Summary

Field Name: 8a / Upper Turkey

Irrigation System Efficiency:	.0 %
Date of Initial Irrigation:	4/15/2007
Current Crop	Alfalfa, Hay, Cut Mature, S-ID, Irrigated
System Flow Rate:	398.0 gpm
Estimated Runoff:	0 %

Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	19.9	1.6	16.8	.0
May	28.0	21.0	19.9	3.9	17.5	.0
Jun	28.0	21.0	19.9	5.6	15.8	.0
Jul	28.0	21.0	19.9	8.0	14.1	.0
Aug	28.0	21.0	19.9	6.4	13.0	.7
Sep	.0	.0	.0	3.4	.0	2.8
Oct	.0	.0	.0	.6	.0	3.3

Hand or Wheel Line Irrigation Summary

Field Name: 8b / Lower Turkey

Irrigation System Efficiency:	.0 %
Date of Initial Irrigation:	4/15/2007
Current Crop	Alfalfa, Hay, Cut Mature, S-ID, Irrigated
System Flow Rate:	398.0 gpm
Estimated Runoff:	0 %

Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	31.7	1.6	28.6	.0
May	28.0	21.0	31.7	3.9	29.3	.0
Jun	28.0	21.0	31.7	5.6	27.6	.0
Jul	28.0	21.0	31.7	8.0	25.9	.0
Aug	28.0	21.0	31.7	6.4	24.8	.8
Sep	.0	.0	.0	3.4	.0	2.9
Oct	.0	.0	.0	.6	.0	3.2

Surface Irrigation Summary

Field Name: 9 / Bull

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	800.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.5	52.0	3.3	8.2	91.7
Jul	7.0	24.0	3.3	52.0	7.7	8.0	91.7
Aug	7.0	24.0	2.7	52.0	6.3	8.1	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Hand or Wheel Line Irrigation Summary						
Field Name: 7 / Snake						
Irrigation System Efficiency:			.0 %			
Date of Initial Irrigation:			4/15/2007			
Current Crop			Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated			
System Flow Rate:			397.7 gpm			
Estimated Runoff:			0 %			
Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	9.4	1.1	7.1	.0
May	28.0	21.0	9.4	4.2	7.1	.0
Jun	28.0	21.0	9.4	.0	7.0	.0
Jul	28.0	21.0	9.4	.0	9.4	.0
Aug	28.0	21.0	9.4	.0	9.4	.0
Sep	.0	.0	.0	.0	.0	.0
Oct	.0	.0	.0	.0	.0	.0

Export Agreement for Waste

I, _____Silverleaf Farm_____, with a physical address of _____9288 Silverleaf Rd, Emmett, ID 83617_____ agree with Treasure Valley Land & Livestock to accept and take delivery of Solid Stack(s) from Treasure Valley Land & Livestock during the farming season. I intend to apply the bionutrient to some or all of the farm ground owned or leased by me in the amounts consistent with best management farming practices. I presently own and/or lease _________110_________ acres of farm ground.

Bionutrient	N (lb/ton)	P2O5 (lb/ton)	K2O (lb/ton)
Solid Stack(s)	474	339	725

Appendix A: ANALYSIS OF SOIL CHARACTERISTICS

Soil Survey (USDA NRCS) information was used to describe the soil variations across each field. **This is not absolute** and may vary for each specific situation. The soil map has broad areas that have distinctive pattern of soils, relief, and drainage. Each map unit on the soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. Because the minor soils are not described in the following summary, the combined acreage for all major soils will be less than the acreage for each field.

Table 1. Soil type across each field

Field Name	Soil Type	Percentage	Approximate Acreage	Surface Texture[1]
1 / Owl	HARPT	100	8.75	COSL
	LANKTREE	100	0.08	L
	HARPT	100	2.91	COSL
2 / Rabbit	HARPT	100	8.21	COSL
	HARPT	100	1.77	L
	LOLALITA	100	1.37	COSL
	POWER	60	0.02	SIL
	PURDAM	40	0.01	SIL
3 / Cottonwood	HARPT	100	19.86	COSL
	LANKTREE	100	0.01	SL
	HARPT	100	0.74	COSL
	HARPT	100	6.13	L
5 / Pheasant	HARPT	100	82.98	L
6 / Skunk	LOLALITA	100	14.19	COSL
	POWER	60	28.56	SIL
	PURDAM	40	19.04	SIL
	POWER	60	48.95	SIL
	PURDAM	40	32.63	SIL
7 / Snake	LANKTREE	100	15.28	L
	LANKTREE	65	10.65	L
	CHILCOTT	25	4.1	SIL
	LOLALITA	100	0.48	COSL

	POWER	60	0.01	SIL
	PURDAM	40	0.01	SIL
	POWER	60	6.55	SIL
	PURDAM	40	4.36	SIL
	HARPT	100	0.07	COSL
8a / Upper Turkey	POWER	60	3.2	SIL
	PURDAM	40	28.07	SIL
	POWER	60	42.1	SIL
	PURDAM	40	19.04	SIL
	PURDAM	40	2.13	SIL
	POWER	60	28.56	SIL
8b / Lower Turkey	DRAPER	100	0.9	L
	POWER	60	7.12	SIL
	PURDAM	40	4.74	SIL
9 / Bull	LOLALITA	100	0.16	COSL
	HARPT	100	9.25	COSL

Note: 1- See Appendix A.

Table 2 contains important soil characteristics for each of the fields identified in this plan. Each soil characteristic listed is representative for the entire field based on a weighted average. *(**Caution:** USDA NRCS Soil Survey information was used to estimate the values reported in Table 2. **These are not absolute values** and may vary for each specific situation. They are estimated values representative for each field.)* The following includes a brief description of each of those factors:

Dominant Surface Texture -- The predominant texture of the surface layer. Soil texture is the relative proportion, by weight, of the particle separate classes (sand, silt, and clay) finer than 2 mm in equivalent diameter. Soil texture influences engineering works and plant growth and is used as an indicator of how soils formed. (See Appendix A)

Available Water Capacity (AWC) -- The volume of water that should be available to plants if the soil, inclusive of fragments, were at field capacity. It is commonly defined as the difference between the amount of soil moisture at field capacity and the amount at permanent wilting point. Typical Available Water Capacities are 0.6 inches/foot for a Sand and 2.0 inches/foot for a Silt Loam. Available Water Capacity is an important soil property in developing water budgets, predicting droughtiness, designing and operating irrigation systems, designing drainage systems, protecting water resources, and predicting yields.

Surface Soil Erodibility Factor (K) -- A factor which quantifies the susceptibility of soil detachment by water. Factors vary from a low of 0.02 to a high of 0.64.

Soil Loss Tolerance (T) -- The maximum amount of erosion at which the quality of a soil as a medium for plant growth can be maintained.

Slope -- The difference in elevation between two points expressed as a percentage of the distance between those points.

Permeability -- The quality of the soil that enables water or air to move through it.

Permeability Class -- Permeability expressed by classes ranging from very rapid to impermeable. (See Appendix A)

Runoff Class - An index of the likelihood for runoff to occur based on inherent soil and slope characteristic. Runoff classes range from Negligible to Very High. (See Appendix A)

Surface pH -- A numerical expression of the relative acidity or alkalinity of the surface soil layer.

Surface pH Classification -- A general descriptive term for soil pH, acid or alkaline.

Table 3 contains additional important soil characteristics for each of the fields identified in this plan. Each soil characteristic listed represents a potential limiting condition within the soil profile (< 5 feet) across the field. ***(Caution:** USDA NRCS Soil Survey information was used to estimate the values reported in Table 2. **These are not absolute values** and may vary for each specific situation. They are estimated values representative for each field.)* The following includes a brief description of each of those factors:

Soil Layer with > 50 % Gravel, Cobble or Stone -- A layer comprised of more than 50 % gravel, cobbles or stones.

Pan - A compact, dense layer in the soil that impedes the movement of water and the growth of roots. Examples include: *hardpan, claypan, plowpan*, and *fragipan*. (See Appendix A)

Rock -- A layer of rock in the soil that impedes the movement of water and the growth of roots.

Seasonal High Water Table -- A seasonal water table that exist near the surface.

Drainage Class - Drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods. Alteration of the water regime by humans, either through drainage or irrigation, is not a consideration unless the alterations have significantly changed the morphology of the soil. (See Appendix A)

Hydrologic Group -- A group of soils having similar runoff potential under similar storm and cover conditions.

Table 2. Soil characteristics representative for each field

Field Name	Representative For Entire Field (Weighted Average)											
	Dominant Surface Texture & (Acreage)[1]	Total Available Water Capacity to 5 feet (in)	Surface Soil Erodibility Factor - K	Soil Loss Tolerance - T (tons/acre)	Calculated Sheet and Rill Erosion Rate[1] (tons/acre)	Calculated Irrigation Induced Erosion Rate[1] (tons/acre)	Slope (%)	Permeability (in/hour)	Permeability Class[1,2]	Runoff Class[1,3]	Surface pH	Surface pH Classification
1 / Owl	COSL(11.59)	10.01	0.24	5	-1	0	8.47	1.27	Moderate	M	6.74	Acid
2 / Rabbit	COSL(9.45)	9.61	0.24	5	-1	-1	9.31	1.6	Moderate	M	6.76	Acid
3 / Cottonwood	COSL(20.54)	10.14	0.26	5	-1	-1	4.49	1.27	Moderate	L	6.74	Acid
5 / Pheasant	L(82.98)	10.53	0.32	5	-1	-1	2	1.27	Moderate	L	6.74	Acid
6 / Skunk	SIL(129.18)	8.96	0.4	4	-1	-1	7.96	1.07	Moderate	M	7.26	Alkaline
7 / Snake	L(27.1)	7.9	0.43	4	-1	-1	17.3	0.32	Moderately Slow	M	7.12	Alkaline
8a / Upper Turkey	SIL(123.09)	9.29	0.43	4	-1	-1	3.65	0.74	Moderate	L	7.3	Alkaline
8b / Lower Turkey	SIL(13.31)	9.16	0.42	4	-1	-1	4.98	0.77	Moderate	L	7.29	Alkaline
9 / Bull	COSL(9.21)	9.97	0.24	5	-1	-1	5.67	1.32	Moderate	M	6.74	Acid

NOTES:

1 - See Appendix A.

2 - PERMEABILITY CLASSES: VR = Very Rapid, R = Rapid, MR = Moderately Rapid, M = Moderate, MS = Moderately Slow, S = Slow, VS = Very Slow, I = Impermeable.

3 - RUNOFF CLASS: N = Negligible, LV = Very Low, L = Low, M = Medium, H = High, HV = Very High.

Table 3. Soil characteristics that represent a potential limiting condition within the soil profile (< 5 feet) across the entire field.

Field Name	Depth to Limiting Layer < 5 feet - Soil Layer with > 50 % Gravel, Cobble or Stone					Depth to Limiting Layer < 5 feet - Pan[1]				
	Dominant Condition		Most Limiting Condition			Dominant Condition		Most Limiting Condition		
	Layer Description[1,2]	Acres	Layer Description[1,2]	Acres	Minimum Depth (in)	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)
1 / Owl	None Present	11.67		11.67	0	Pan Present	11.67	Pan Present	11.67	0
2 / Rabbit	None Present	11.23	GRV	0.01	48	Pan Present	11.23	Pan Present	0.01	20
3 / Cottonwood	None Present	26.3		26.3	0	Pan Present	26.3	Pan Present	26.3	0
5 / Pheasant	None Present	82.98		82.98	0	No Pan Present	82.98	No Pan Present	82.98	0
6 / Skunk	None Present	91.7	GRV	51.67	48	No Pan Present	91.7	Pan Present	51.67	20
7 / Snake	None Present	33.94	GRV	4.55	47	Pan Present	33.94	Pan Present	8.79	20
8a / Upper Turkey	None Present	73.86	GRV	49.24	48	No Pan Present	73.86	Pan Present	49.24	20
8b / Lower Turkey	None Present	8.98	GRV	0.05	47	Pan Present	8.98	Pan Present	5.35	20
9 / Bull	None Present	9.21		9.21	0	Pan Present	9.21	Pan Present	9.21	0

Field Name	Depth to Limiting Layer < 5 feet - Rock					Depth to Limiting Layer < 5 feet - Seasonal High Water Table				
	Dominant Condition		Most Limiting Condition			Dominant Condition		Most Limiting Condition		
	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)
1 / Owl	No Rock Layer Present	11.67	No Rock Layer Present	11.67	N/A	Water Table Present	11.67	Water Table Present	11.67	6
2 / Rabbit	No Rock Layer Present	11.24	No Rock Layer Present	11.24	N/A	Water Table Present	11.24	Water Table Present	11.24	6
3 / Cottonwood	No Rock Layer Present	26.3	No Rock Layer Present	26.3	N/A	Water Table Present	26.3	Water Table Present	26.3	6
5 / Pheasant	No Rock Layer Present	82.98	No Rock Layer Present	82.98	N/A	No Water Table Present	82.98	No Water Table Present	82.98	6
6 / Skunk	No Rock Layer Present	143.37	No Rock Layer Present	143.37	N/A	No Water Table Present	143.37	No Water Table Present	143.37	6
7 / Snake	No Rock Layer Present	42.73	No Rock Layer Present	42.73	N/A	Water Table Present	42.73	Water Table Present	42.73	6
8a / Upper Turkey	No Rock Layer Present	123.09	No Rock Layer Present	123.09	N/A	No Water Table Present	123.09	No Water Table Present	123.09	6
8b / Lower Turkey	No Rock Layer Present	14.34	No Rock Layer Present	14.34	N/A	Water Table Present	13.44	Water Table Present	0.9	2
9 / Bull	No Rock Layer Present	9.21	No Rock Layer Present	9.21	N/A	Water Table Present	9.21	Water Table Present	9.21	6

Field Name	Drainage Class[1,3]		Hydrologic Group[1]	
	Dominant Drainage Class	Acres	Dominant Hydrologic Group	Acres
1 / Owl	Well drained	11.67	B	11.59
2 / Rabbit	Well drained	11.24	B	11.24
3 / Cottonwood	Well drained	26.3	B	26.28
5 / Pheasant	Well drained	82.98	B	82.98
6 / Skunk	Well drained	143.37	B	143.37
7 / Snake	Well drained	42.73	C	31.66
8a / Upper Turkey	Well drained	123.09	B	123.09
8b / Lower Turkey	Well drained	13.44	B	13.26
9 / Bull	Well drained	9.21	B	9.21

NOTES:

1 - See Appendix A.

2 - GRAVEL, COBBLE, or STONE: GRV = Very Gravelly, GRX = Extremely Gravelly, CBV = Very Cobbly, CBX = Extremely Cobbly, STV = Very Stony, STX = Extremely Stony, WB = Weathered Bedrock, and UWB = Unweathered Bedrock.

3 - DRAINAGE CLASS: E = Excessively drained, SE = Somewhat Excessively drained, W = Well drained, MW = Moderately Well drained, SP = Somewhat Poorly drained, P = Poorly drained, VP = Very Poorly drained.

ANALYSIS OF SOIL CHARACTERISTICS Legend

Soil Pan

Hardpan – A hardened or cemented layer soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Claypan – A slowly permeable soil horizon that contains much more clay than the horizon above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Plowpan – A compacted layer formed in the soil directly below the plow layer.

Fragipan – A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restrict roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than deform slowly.

Soil Drainage Class

Excessively drained (E). Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse-textured and have very high hydraulic conductivity or are very shallow. They are not suited to crop production unless irrigated.

Somewhat excessively drained (SE). Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep. The soils are commonly coarse-textured and have high saturated hydraulic conductivity or are very shallow. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained (W). Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons.

Moderately well drained (MW). Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a moderately low or lower saturated hydraulic conductivity in a layer within the upper 1 m, periodically receive high rainfall, or both.

Somewhat poorly drained (SP). Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.

Poorly drained (P). Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

Very poorly drained (VP). Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

Soil Hydrologic Group

Group A – Soils that have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands and gravels. These soils have a high rate of water transmission (greater than 0.30 in/hr).

Group B – Soils that have moderate infiltration rates when thoroughly wetted. They consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (greater than 0.15 – 0.30 in/hr).

Group C – Soils that have low infiltration rates when thoroughly wetted. They consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (greater than 0.05 - 0.15 in/hr).

Group D – Soils that have high runoff potential. They have very low infiltration rates when thoroughly wetted. They consist chiefly of clay soils with high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over impervious material. These soils have a very low rate of water transmission (greater than 0.0 - 0.05 in/hr).

Soil Permeability Class

Very Rapid:	20.0 to 100.0 inches/hour
Rapid:	6.0 to 20.0 inches/hour
Moderately Rapid:	2.0 to 6.0 inches/hour
Moderate:	0.6 to 2.0 inches/hour
Moderately Slow:	0.2 to 0.6 inches/hour
Slow:	0.06 to 0.20 inches
Very Slow:	0.0015 to 0.06 inches/hour
Impermeable:	0.0000 to 0.0015 inches/hour

Soil Texture Modifiers, Texture Class and Terms Used in Lieu of Texture.

Texture Modifiers

ASHY	Ashy
BY	Bouldery
BYV	Very bouldery
BYX	Extremely bouldery
CB	Cobbly
CBV	Very cobbly
CBX	Extremely cobbly
CN	Channery
CNV	Very channery
CNX	Extremely channery
COP	Coprogenous
DIA	Diatomaceous
FL	Flaggy
FLV	Very flaggy
FLX	Extremely flaggy
GR	Gravelly
GRC	Coarse gravelly
GRF	Fine gravelly
GRM	Medium gravelly
GRV	Very gravelly
GRX	Extremely gravelly
GS	Grassy
GYP	Gypsiferous
HB	Herbaceous
HYDR	Hydrous
MEDL	Medial
MK	Mucky
MR	Marly
MS	Mossy
PBY	Parabouldery
PBYV	Very Parabouldery
PBYX	Extremely Parabouldery
PCB	Paracobbly
PCBV	Very Paracobbly
PCBX	Extremely Paracobbly

Texture Class

C	Clay
CL	Clay loam
COS	Coarse sand
COSL	Coarse sandy loam
FS	Fine sand
FSL	Fine sandy loam
L	Loam
LCOS	Loamy coarse sand
LFS	Loamy fine sand
LS	Loamy sand
LVFS	Loamy very fine sand
S	Sand
SC	Sandy clay
SCL	Sandy clay loam
SI	Silt
SIC	Silty clay
SICL	Silty clay loam
SIL	Silt loam
SL	Sandy loam
VFS	Very fine sand
VFSL	Very fine sandy loam

Terms used in lieu of texture

BR	Bedrock
BY	Boulders
CB	Cobbles
CN	Channers
DUR	Duripan
FL	Flagstones
G	Gravel
HPM	Highly Decomposed plant material
MAT	Material
MPM	Moderately Decomposed plant material
MPT	Mucky peat
MUCK	Muck
OR	Ortstein
PBY	Paraboulders
PC	Petrocalcic
PCB	Paracobbles
PCN	Parachanners
PEAT	Peat
PF	Petroferric
PFL	Paraflagstones
PG	Paragravel
PGP	Petrogypsic
PL	Placic
PST	Parastones
SPM	Slightly Decomposed plant material
ST	Stones
W	Water

PCN	Parachannery
PCNV	Very Parachannery
PCNX	Extremely Parachannery
PF	Permanently frozen
PFL	Paraflaggy
PFLV	Very Paraflaggy
PFLX	Extremely Paraflaggy
PGR	Paragravelly
PGRV	Very Paragravelly
PGRX	Extremely Paragravelly
PST	Parastony
PSTV	Very Parastony
PSTX	Extremely Parastony
PT	Peaty
ST	Stony
STV	Very stony
STX	Extremely stony
WD	Woody

Appendix B: NUTRIENT RISK ANALYSIS

Phosphorus Runoff Risk Assessment

FIELD: 1 / Owl
Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 2 / Rabbit

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 93.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: Incorporated < 3 inches (Harrowing/etc)

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High

Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 3 / Cottonwood
Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.
Soil Test P **Risk Rating:** Critical
Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data
Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data
Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen
Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible

with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 5 / Pheasant
Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.
Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data
Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data
Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen
Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** High
Manure Application Method: Incorporated >3 inches (Disking/Chiseling)
Comments: For greatest phosphorus efficiency inject Organic P > 2" or plow; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 6 / Skunk

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 93.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** High

Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject Organic P > 2" or plow; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High

Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.

Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 7 / Snake

Overall Risk Rating: High

High potential for P loss and adverse effects on surface and/or ground waters. Soil and water conservation measures and phosphorus management plans are needed to reduce the probability of phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the Idaho OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Very High

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 20 **Soil Test Type:** Olsen

Comments: Soil test P is very high and may be approaching the critical Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 69.8
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: N/A
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.
Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** Very Low or N.A.
List best management practices that mitigate runoff(See Appendix B)
Comments: No Data

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 8a / Upper Turkey

Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 52.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.

Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.

Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 8b / Lower Turkey

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 52.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.

Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.

Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 9 / Bull

Overall Risk Rating: **Very High**

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** Very Low or N.A.
Phosphorus Application Method: Not Applied
Comments: No Data

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

Nutrient Leaching Risk Assessment

FIELD: 1 / Owl

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 2 / Rabbit

Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Low

Deep Percolation (as % of Evapotranspiration): 11-20% Over ET

Comments: Nutrient leaching should not be a problem. Apply water according to crop requirements. Monitor soil Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) for salt accumulation. Do not apply nitrogen prior to leaching events.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 3 / Cottonwood
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied).

Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 5 / Pheasant

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Low

Deep Percolation (as % of Evapotranspiration): 11-20% Over ET

Comments: Nutrient leaching should not be a problem. Apply water according to crop requirements. Monitor soil Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) for salt accumulation. Do not apply nitrogen prior to leaching events.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 6 / Skunk

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 7 / Snake
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Low

Comments: Because the dominant soils have slow infiltration rates and water transmission, this field will probably not contribute to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water should be minimal.

FIELD: 8a / Upper Turkey
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 8b / Lower Turkey
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 9 / Bull
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Very Low or N.A.

Comments: Good job! Follow Nitrogen application recommendations and apply according to crop growth needs.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

NUTRIENT RISK ANALYSIS Legend

BMP	Definition	Purpose
Buffer Strip	Contour buffer strips are strips of perennial grass alternated with wider cultivated strips that are farmed on the contour.	Contour buffer strips slow runoff water and trap sediment. Consequently, soil erosion is generally reduced significantly by this practice. Sediments, nutrients, pesticides, and other potential pollutants are filtered out as water flows through the grass strips. The grass strips also provide food and cover for wildlife.
Channel Vegetation	Establishing and maintaining adequate plants on channel banks, berms, spoil, and associated areas.	To stabilize channel banks and adjacent areas and reduce erosion and sedimentation. To maintain or enhance the quality of the environment, including visual aspects and fish and wildlife habitat.
Chiseling and Subsoiling	Loosening the soil, without inverting and with a minimum of mixing of the surface soil, to shatter restrictive layers below normal plow depth that inhibit water movement or root development.	To improve water and root penetration and aeration.
Composting Facility	A composting facility is	The purpose of this

	installed for biological stabilization of waste organic material.	practice is to biologically treat waste organic material and produce humus-like material that can be recycled as a soil amendment or organic fertilizer. The material may also be used by other acceptable methods of recycling that comply with laws, rules and regulations.
Conservation Cover	This practice involves establishing and maintaining a protective cover of perennial vegetation on land retired from agriculture production.	This practice reduces soil erosion, associated sedimentation, improves water quality, and creates or enhances wildlife habitat.
Conservation Cropping Sequence	Growing crops in a recurring sequence on the same field.	This practice may be applied as part of a best management practice to support one or more of the following: Reduce sheet and rill erosion, Reduce irrigation induced erosion, Reduce soil erosion from wind, Maintain or improve soil organic matter content, Manage deficient or excess plant nutrients, Improve water use efficiency, Manage saline seeps, Manage plant pests (weeds, insects, diseases), Provide food for domestic livestock, and Provide food and cover for wildlife.
Contour Farming	Farming sloping land in	To reduce erosion and

	such a way that preparing land, planting, and cultivating are done on the contours. (This includes following established grades of terraces or diversion.)	control water.
Cover and Green Manure Crop	A crop of close-growing, legumes, or small grain grown primarily for seasonal protection and soil improvement. It usually is grown for 1 year or less, except where there is permanent cover as in orchards.	To control erosion during periods when the major crops do not furnish adequate cover; add organic material to the soil; and improve infiltration, aeration, and tilth.
Critical Area Planting	Planting vegetation on critically eroding areas that require extraordinary treatment.	This practice is used on highly erodible areas that cannot be stabilized by ordinary planting techniques and if left untreated may cause severe erosion or sediment damage. Examples of critical areas include the following: 1) Dams, dikes, levees, and other construction sites with very steep slopes, 2) Mine spoil and surface mined land with poor quality soil and possibly chemical problems, and 3) Agriculture land with severe gullies requiring specialized planting techniques and management.
Dike or Berm	An embankment constructed of earth or other suitable materials	Dikes are used to: Permit improvement of agricultural land by

	to protect land against overflow or to regulate water.	preventing overflow and better use of drainage facilities, Prevent damage to land and property, Facilitate water storage and control in connection with wildlife and other developments, and Protect natural areas, scenic features and archeological sites from damage.
Diversion	A channel constructed across the slope with a supporting ridge on the lower side.	To divert excess water from one area for use or safe disposal in other areas.
Drip Irrigation	A planned irrigation system in which all necessary facilities are installed for efficiently applying water directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe) operated under low pressure. The applicators can be placed on or below the surface of the ground.	To efficiently apply water directly to the plant root zone to maintain soil moisture within the range for good plant growth and without excessive water loss, erosion, reduction in water quality, or salt accumulation.
Filter Strip	A strip or area of vegetation for removing pollutants water.	A filter strip reduces pollution by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization of sediment, organic matter, and other pollutants from runoff and waste water.
Fish Stream Improvement	Fish Stream Improvement is	The purpose of the practice is to increase

	improving a stream channel to make or enhance fish habitat.	production of desired species of fish. The practice involves improving food supplies, shelter, spawning areas, water quality, and other elements of fish habitat.
Grade Stabilization Construction	A structure used to control the grade and head cutting in natural or artificial channels.	These structures are to: Stabilize the grade and control erosion in natural or artificial channels, prevent the formation or advance of gullies, enhance environmental quality, and reduce pollution hazards.
Grassed Waterway	A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.	Grassed waterways convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and to improve water quality.
Grazing Land Mechanical Treatment	Modifying physical soil and/or plant conditions with mechanical tools by treatments such as; pitting, contour furrowing, and ripping or sub-soiling.	This practice should be applied as part of a best management practice to support one or more of the following purposes: Fracture compacted soil layers and improve soil permeability, Reduce water runoff and increase infiltration, Break up sod bound conditions and thatch to increase plant vigor, and Renovate and stimulate plant community for greater productivity and yield.

Heavy Use Area Protection	Protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.	To stabilize urban, recreation, or facility areas frequently and intensely used by people, animals, or vehicles.
Irrigation Land Leveling	Reshaping the surface of land to be irrigated to planned grades.	To permit uniform and efficient application of irrigation water without causing erosion, loss of water quality, or damage to land by waterlogging and at the same time to provide for adequate surface drainage.
Irrigation Water Management	Irrigation water management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner.	Irrigation water management is applied as part of a conservation management system to support one or more of the following: Manage soil Moisture to promote desired crop response; Optimize use of available water supplies; Minimize irrigation induced soil erosion; Decrease non-point source pollution of surface and groundwater resources; Manage salts in the crop root zone; Manage air, soil, or plant micro-climate.
Mulching	Applying plant residues or other suitable materials not produced on the site to the soil surface.	To conserve moisture; prevent surface compaction or crusting; reduce runoff and erosion; control weeds; and help establish plant cover.

Polyacrylamide (PAM)	Polyacrylamide is an organic polymer formulated to stabilize soil when applied in irrigation water.	Water applied with PAM stabilizes soil aggregates which can then resist the erosive forces of water. If correctly applied, PAM will produce clear runoff water and reduce erosion within the field by over 90 percent.
Prescribed Grazing	Prescribed grazing is the controlled harvest of vegetation with grazing animals, managed with the intent to achieve a specific objective.	Application of this practice will manipulate the intensity, frequency, duration, and season of grazing to: 1) Improve water infiltration, 2) maintain or improve riparian and upland area vegetation, 3) protect stream banks from erosion, 4) manage for deposition of fecal material away from water bodies, and 5) promote ecological and economically stable plant communities which meet landowner objectives.
Residue Management (Conservation Tillage)	Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface.	This practice may be applied as part of a conservation system to support one or more of the following: Reduce sheet and rill erosion. Reduce wind erosion. Maintain or improve soil organic matter content and tilth. Conserve soil moisture. Manage snow to increase plant available moisture. Provide food and escape cover for wildlife.

Riparian Forest Buffer	A riparian forest buffer is an area of trees and/or shrubs located adjacent to a body of water. The vegetation extends outward from the water body for a specified distance necessary to provide a minimum level of protection and/or enhancement.	The riparian forest buffer is a multi-purpose practice design to accomplish one or more of the following: Create shade to lower water temperatures and improve habitat for aquatic animals, Provide a source of debris necessary for healthy robust populations of aquatic organisms and wildlife, and Act as a buffer to filter out sediment, organic material, fertilizer, pesticides and other pollutants that may adversely impact the water body, including shallow ground water.
Sediment Basin	A basin constructed to collect and store debris or sediment.	A sediment basin may have the following uses: Preserve the capacity of reservoirs, ditches, canals, diversion, waterways, and streams, Prevent undesirable deposition on bottom lands and developed areas, Trap sediment originating from construction sites, and Reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.
Sprinkler System	A planned irrigation	To efficiently and

	system in which all necessary facilities are installed for efficiently applying water by means of perforated pipes or nozzles operated under pressure.	uniformly apply irrigation water to maintain adequate soil moisture for optimum plant growth without causing excessive water loss, erosion, or reduced water quality.
Stream Channel Stabilization	Stabilizing the channel of a stream with suitable structures.	To control aggradation or degradation in a stream channel.
Streambank Protection	Using vegetation or structures to stabilize and protect banks of streams, lakes, estuaries, or excavated channels against scour and erosion.	To stabilize or protect banks of streams, lakes, estuaries, or excavated channels for one or more of the following purposes: Prevent the loss of land or damage to utilities, roads, buildings, or other facilities adjacent to the banks, Maintain the capacity of the channel, Control channel meander that would adversely affect downstream facilities, Reduce sediment loads causing downstream damages and pollution, and Improve the stream for recreation or as a habitat for fish and wildlife.
Stripcropping, Contour	Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a	To reduce sheet and rill erosion and/or to reduce transport of sediment and other water-borne contaminants.

	strip of clean-tilled crop or fallow or a strip of grass is alternated with a close-growing crop.	
Stripcropping, Field	Growing crops in a systematic arrangement of strips or bands across the general slope (not on the contour) to reduce water erosion. The crops are arranged so that a strip of grass or a close-growing crop is alternated with a clean-tilled crop or fallow.	To help control erosion and runoff on sloping cropland where contour stripcropping is not practical.
Subsurface Drains	A Subsurface Drain is a conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	The purpose of a subsurface drain is to: Improve the environment for vegetation, Reduce erosion, Improve water quality, Collect ground water for beneficial use, Remove water from heavy use areas such as recreation areas, or around buildings, and Regulate water to control health hazards caused by pests.
Surge Irrigation	Surge irrigation is the intermittent application of water to furrows, corrugates, or borders creating a series of on and off periods of constant or variable time spans.	Surge allows a lighter application of water with a higher efficiency. The result is less deep percolation of water at the upper end of the field and a more uniform application.
Tailwater Recovery & Pumpback System	A facility to collect, store, and transport	To conserve farm irrigation water supplies

	irrigation tailwater for reuse in a farm irrigation distribution system.	and water quality by collecting the water that runs off the field surface for reuse on the farm.
Terraces	An earth embankment, a channel, or a combination ridge and channel constructed across the slope.	Reduce slope length, reduce sediment content in runoff water, reduce erosion, Improve water quality, intercept and conduct surface runoff at a non-erosive velocity to a stable outlet, retain runoff for moisture conservation, prevent gully development, reform the land surface, improve farmability, and reduce flooding.
Use Exclusion	Excluding animals, people or vehicles from an area.	To protect, maintain, or improve the quantity and quality of the plant, animal, soil, air, water, and aesthetics resources and human health and safety.
Water and Sediment Control Basin	An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.	To improve farmability of sloping land, reduce watercourse and gully erosion, trap sediment, reduce and manage onsite and downstream runoff, and improve downstream water quality.
Watering Facility	A device (tank, trough, or other watertight container) for providing animal access to water.	To provide watering facilities for livestock and/or wildlife at selected locations in order to: 1) protect and enhance vegetative cover through

		proper distribution of grazing; 2) provide erosion control through better grassland management; or 3) protect streams, ponds and water supplies from contamination by providing alternative access to water.
Wetland Development/Restoration	The construction or restoration of a wetland facility to provide the hydrological and biological benefits of a wetland.	To develop or restore hydric soil conditions, hydrologic conditions, hydrophytic plant communities, and wetland functions.

Appendix C: CROP SPECIFIC GUIDELINES

Alfalfa, Hay, Cut Mature, S-ID, Irrigated
UNIVERSITY OF IDAHO INFORMATION

SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.
GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.
THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate ($NO3-N$) and ($NH4-N$) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

Nutrient requirements for alfalfa are relatively high compared to many other crops commonly grown in Idaho. Each ton of alfalfa hay removes about 60 lb nitrogen (N) per acre, 50 lb potassium (K) per acre, 30 lb calcium (Ca) per acre, 8 lb phosphorus (P) per acre, and about 6 lb per acre of both sulfur (S) and magnesium (Mg). Requirements for phosphorus and potassium fertilizers are much higher than for S, manganese (Mn), zinc (Zn), iron (Fe), and boron (B).

NITROGEN (N)

Essentially all nitrogen required by established alfalfa is provided by the symbiotic relationship with N-fixing Rhizobium bacteria and N mineralized from soil organic matter. Top dressed N usually does not improve yield, quality, or vigor of established stands. However, applications of 20 to 40 lb N per acre may be helpful during stand establishment prior to nodulation of the roots. Applied N would most likely be needed following small grain production in which the residue is returned to the soil. Application of larger amounts may inhibit nodulation, decrease symbiotic N fixation, and encourage grass weeds, thereby reducing alfalfa growth or quality when harvested. Alfalfa receiving appreciable amounts of animal manures, dairy effluent, or other organic N sources will also have reduced N fixation. The probability of an N response is usually greatest on coarse-textured soils with low organic matter content. Nitrogen fertilizer may be required for maximum alfalfa production and quality if the roots are poorly nodulated. Poor nodulation as well as poor Rhizobial activity and N-fixing capacity can result from a number of factors, including lack of proper seed inoculation at planting, diseases, insects, water deficits, nutrient deficiencies or toxicities, or other soil physical or chemical conditions that reduce the effectiveness of the Rhizobium inoculant. Poor inoculation results from not using inoculant, using inoculant that has lost its viability (expired shelf life), or using Rhizobium inoculant strains that are not effective. Poor inoculation, nodulation, or Rhizobial effectiveness is indicated when alfalfa protein is low (less than 18%) when cut at the early bloom stage. Healthy Rhizobium nodules should be pink when cut open if they are effectively fixing atmospheric N. If nodulation or Rhizobial effectiveness is limited by pests, water deficits, or soil conditions such as salinity, sodicity, nutrient deficiencies, or soil compaction, then attempts should be made to correct the problem through appropriate management practices. For more information on proper inoculation of alfalfa, refer to CIS 838, (Inoculation of Legumes in Idaho). Alfalfa is sometimes used to scavenge nutrients from soils receiving excessive animal manure or other biological waste applications. An alfalfa crop yielding 6 tons per acre can remove up to 360 lb of N per acre. However, excessive nitrogen uptake can increase the forage nitrate toxicity hazard for dairy and beef cattle. In addition, animal manure applications can promote grass and weed growth, which in turn can also increase the potential for nitrate toxicity if the population of the noxious weed Kochia increases.

Producers sometimes plant a companion crop when establishing alfalfa in order to increase the productivity of the first cutting. However, this practice is not recommended because the alfalfa stand typically is reduced by competition from the companion crop. If growers plant alfalfa with a companion crop, both crops compete for the available N. Under these conditions, N rates of 30 to 40 lb per acre are suggested if available soil N does not exceed 60 to 80 lb per acre.

PHOSPHORUS (P)

Adequate phosphorus availability is important for maintaining plant health, winter hardiness, and optimum root, stem, and leaf growth. Since phosphorus is relatively immobile in soil, P fertilizer should be incorporated into the soil prior to planting to raise soil P concentrations to optimum levels for early plant growth. The phosphorus recommendations presented are based on the soil test P concentration and free lime content in the top foot of soil, and the yield potential. Significant amounts of free lime in the soil will make less phosphorus available to plants as it precipitates soil solution P. Top dressed P applications can also be effective but should be made following harvest in the fall or in the spring before regrowth in order to maximize soil contact. Knifing ammonium polyphosphate (10-34-0) into the soil or applying surface bands in the fall or spring are also effective P fertilization methods for alfalfa. As the stand ages and plant density decreases, the ability of the alfalfa root system to take up P diminishes due to decreased soil P concentrations and root activity. Under these conditions, smaller P rates applied more frequently may increase P uptake efficiency. Effective sources of P for alfalfa include monoammonium phosphate (11-52-0), triple superphosphate (0-45-0), ammonium polyphosphate (10-34-0), and phosphoric acid. Fertilizer P can be broadcast as 11-52-0 or applied through the irrigation system as 10-34-0 with equal effectiveness. Phosphorus sources should be selected on the basis of cost, local availability, and equipment requirements.

POTASSIUM (K)

Alfalfa has a high potassium requirement. A crop of 8 tons per acre will remove about 480 lb of K2O per acre. Most Idaho soils and surface irrigation waters are naturally high in K. However, K deficiencies can develop in intensively cropped fields, particularly those fields cropped to alfalfa for many years. Sandy soils are generally more prone to developing K deficiencies than silt loam or clay soils and therefore have a higher probability of responding to K fertilization. Potassium movement in soils is limited, although it is more mobile than P. Like phosphorus, potassium fertilizer recommendations are based on calibrated relationships between soil test concentrations in the top foot of soil and yield response. Soil test K should generally be in the range of 160 to 200 ppm for optimum alfalfa yield. Potassium fertilizer should also be incorporated during seedbed preparation prior to establishment, or broadcast in the fall or early spring on established stands. Potassium chloride (0-0-60), potassium sulfate (0-0-52), K-Mag, and various liquid K fertilizers are all effective K sources for alfalfa. Potassium applications exceeding 300 lb K2O per acre should be split between fall and spring to avoid salt damage. Excessive K applications should be avoided since alfalfa will remove substantially more K than it needs for maximum yield. Excessive K concentrations in alfalfa can contribute to milk fever in dairy cattle.

SULFUR (S)

Sulfur is a key contributor to alfalfa yield and quality. Sulfur requirements for alfalfa vary with soil texture, leaching losses, soil test SO4-S concentration, and S content of the irrigation water. About 30 to 40 lb of SO4-S should be applied before planting to soils containing less than 10ppm SO4-S in the top foot of soil. This amount should provide adequate soil S for several years, provided the SO4-S is not leached from the rooting depth. The SO4-S form is mobile and can be leached to lower soil profile depths. For established alfalfa, sampling to a depth of two feet will provide a more accurate indication of S availability to alfalfa roots beyond the first foot. Areas irrigated with water from the Snake River or streams fed by return flow should have adequate S for alfalfa production. High rainfall areas, mountain valleys, and foothills are more likely to have S deficiencies, particularly on course-textured soils with low organic matter content. Sulfur fertilizer sources should be carefully selected because elemental S must be converted to SO4-S by soil microorganisms before plant roots can take it up. Conversion of elemental S to SO4-S may take several months in warm, moist soil. Consequently, elemental S fertilizers usually cannot supply adequate levels of S to alfalfa in the year that it is applied. However, elemental S fertilizers can supply considerable S during the year following application. Sulfate-sulfur sources such as gypsum (calcium sulfate), ammonium sulfate (21-0-0), or potassium sulfate (0-0-52-18) are recommended to correct S deficiencies during the year of application.

SECONDARY NUTRIENTS AND MICRONUTRIENTS

CALCIUM (Ca) and MAGNESIUM (Mg) deficiencies in alfalfa are rare in the irrigated areas of southern Idaho. Most soils in the Snake River plain have adequate amounts of Ca and Mg for alfalfa production, although low soil Mg concentrations are sometimes encountered on very sandy soils that have been heavily fertilized with K for long periods. Under these conditions, applications of MgSO4 or K-Mag at 20 to 40 lb of Mg per acre may provide a benefit. Micronutrient applications should be based on recent soil test results.

BORON (B) deficiencies can usually be corrected by applying 2 to 3 lb of B per acre for the duration of the crop. However, on very sandy soils, or high rainfall areas where soils are subject to excessive leaching of B, annual applications of 1/2 to 1 lb of B per acre may be more Sulfur effective. Commonly used forms of B include boric acid, Borax, and sodium borate.

ZINC (Zn), MANGANESE (Mn), and IRON (Fe) deficiencies can be corrected by applying 5 to 10 lb per acre of the required nutrient using Zn, Mn, or Fe sulfates or other soluble forms.

MOLYBDENUM (Mo) availability is generally adequate in the alkaline soils that are prevalent in the irrigated areas of southern Idaho.

TISSUE TESTING

Plant tissue testing provides an effective means of evaluating the nutrient status of an established alfalfa stand. Samples should be collected from about 20 to 30 plants at early bloom in representative areas of the field that are free from water stress or obvious pest problems. The top six inches of the stem should be sampled and sent immediately to a soil testing lab for analysis. Sufficiency ranges for the various nutrients are presented below. Nutrient concentrations below these ranges indicate a need for supplemental fertilization. When nutrient deficiencies are identified during the growing season, the deficiencies can often be corrected by injecting water-soluble fertilizers through the sprinkler system. Liquid forms of N, P, K, S, and micronutrients are commonly available in Idaho and should be selected on the basis of cost relative to dry fertilizers and ease of application. If alfalfa is furrow irrigated, foliar sprays can be used to correct micronutrient deficiencies but avoid foliar applications of N, P, K, and S at high rates that can cause foliar burning.

Contact your County Extension Agent if you have any questions regarding the interpretation of this information or for further information on your local needs.

Corn, Field, Silage, S-ID, Irrigated
UNIVERSITY OF IDAHO INFORMATION

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FERTILIZER GUIDE

NITROGEN (N)

Nitrogen rates depend upon some of the following factors: previous crop, past fertilizer use, soil type and leaching hazard and realistic yield goal for the grower and the area. Adequate N is necessary for maximum economic production of irrigated field corn used for silage or grain. Fertilizer N represents by far the largest share of the fertilizer costs for field corn in Idaho. The amount of N required depends on many factors that influence total corn production and quality. These factors include length of growing season, corn hybrid, previous crop, past fertilizer use, soil type, leaching hazard and previous manuring. Estimates of both the N available to corn during the season and the yield potential of the crop should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical field corn yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a good field corn yield depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by corn for maximum yield.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate (N03-N) and ammonium (NH4-N), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (N03, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high as or higher than N03-N. NH4-N should be determined along with N03-N, especially when there is reason to expect the presence of appreciable NH4-N, such as recent ammonium N fertilizer applications. Soil samples should be collected before seeding in the spring to represent the area to be fertilized.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, "Wheat Straw Management and Nitrogen Fertilizer Requirements." Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of field corn. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which field corn is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciably depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to field corn. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side dressed.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required producing a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - (Irrigation Water)

TIMING OF NITROGEN APPLICATION - Coarse-textured soils, including sandy loams, loamy soils and sands, may lose N from leaching. For these soils, side dress a portion of the N at the time of the last cultivation. Sprinkler irrigation of corn under center pivots provides increased flexibility for providing N during the season. With sprinklers N can be injected into the system and applied with the water. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated. High N rates (approaching 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. High plant populations (above 28,000 to 30,000) and early plantings of longer season hybrids in the Treasure Valley will respond to high N rates provided there are no other limiting factors. High N rates will not compensate for reductions in stand or delayed plantings. High plant populations of field corn are more susceptible to N shortages because of greater competition among plants for limited N. Side dressing may cause root pruning depending on plant size, distance of shank from the row and placement depth. High N rates (above 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. On sandy textured soils subject to leaching, side dress a portion of the N at the time of the last cultivation. Under sprinkler irrigations, N can be injected through the lines throughout the season. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated.

PHOSPHORUS (P)

Adequate phosphorus is necessary for maximum production of field corn. The soil test for P is based on samples collected from the first foot of soil. The soil is extracted with sodium bicarbonate. Economic response to fertilizer P is more likely with cooler soil temperatures and soils with high lime content, particularly when planting long season hybrids. Phosphorus is an immobile nutrient that does not move appreciably from where it is placed. It should be mixed into the seedbed or banded within easy reach of the seedling roots before or during the planting operation.

POTASSIUM (K)
Field corn requires adequate potassium for optimum growth. Soil test K can be useful in determining the need for K fertilizers. The soil sample is taken from the first foot of soil and extracted with sodium bicarbonate. Fertilizer K rates are based on soil test.

SULFUR (S)
The major corn-growing regions in Idaho should not experience shortages of S. Areas with S deficiencies include some irrigated areas where both the soil and irrigation water are low in S. Snake River water is known to have high S concentrations. Coarse-textured soils including sandy loams, loamy sands and sands would be more susceptible to S deficiencies than silt loam soils. Where the need for S is evident, use 30 pounds per acre of sulfate-sulfur (S04).

MICRONUTRIENTS
1) Zinc (Zn) deficiencies occur primarily on soils that are eroded, leveled or where the exposed subsoil is higher in lime. The DTPA test on soil samples collected from the first foot can be used for identifying Zn fertilizer needs. Apply 10 pounds of Zn per acre when the soil test measures less than 0.6 ppm.

2) Other micronutrients have not been shown to limit corn production. "Shotgun" applications of micronutrient mixtures containing boron (B), copper (Cu), iron (Fe) and manganese (Mn) "for insurance" have not been shown to be economical and are not recommended.

SALINITY (SALTS)
Field corn has a low to moderate tolerance to accumulated salts. Soils with total salt readings above 3 or 4 mmhos/cm can be cropped effectively. Readings up to 6 are also satisfactory although more careful water management may be required.

Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated
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SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking

the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.

GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.

THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO3-N) and (NH4-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Adequate nitrogen is necessary for maximum production of irrigated triticale. Nitrogen represents, by far, the largest share of fertilizer costs for triticale in Idaho. The amount of nitrogen required depends on many factors which influence total triticale production and quality. Both yield potential and available nitrogen (N03 + NH4) should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical triticale yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a bushel of irrigated triticale depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by triticale for maximum yield. The results of irrigated field trials in the Boise and Magic valleys suggest as a rule that 2 pounds available N per bushel of triticale is required for maximum production up to 120 bushels per acre. Above 120 bushels per acre, the factor is somewhat less than two.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate (N03-N) and ammonium (NH4-N), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (N03, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high or higher than N03-N. NH4-N should be determined along with N03-N, especially when there is reason to expect the presence of appreciable NH4-N, such as recent ammonium N fertilizer applications. A preplant soil sample is often only collected from the first foot of soil. Although this information is not as complete and reliable as would be provided by deeper sampling, residual N measurements from the first foot of soil can be combined with estimates of residual N in the second foot to predict N requirements for irrigated winter triticale. For fall planted winter cereals in western Idaho, preplant soil test N03-N in the second foot of the soil is commonly only one-half to two-thirds as high as in the first foot of soil. However, this estimate may not be accurate after potatoes or other sprinkler irrigated crops, especially in coarser textured soils. Basing N rate recommendations on estimates of residual N in the second foot increases the risk of recommending either too little or too much N.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, "Wheat Straw Management and Nitrogen Fertilizer Requirements." Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of winter triticale. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which winter triticale is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciable depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to winter triticale. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side-dressed.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required to produce a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - Irrigation Water

TIMING OF NITROGEN APPLICATION - Excessive irrigation or heavy winter precipitation can result in leaching of nitrate N beyond the root systems. This hazard exists on all soils, but particularly on coarse textured soils such as sands, and sandy loams. Fall pre-plant N was once thought to be as good or preferable to spring top-dressed N in calcareous silt loam or clay soils in areas of low rainfall. However, even under these conditions, southern Idaho research has shown than N applied in late winter or early spring is frequently used more effectively than early fall preplant applied N. Nitrogen fertilizers containing ammonium (ammonium sulfate, anhydrous or aqua ammonia, or urea) are less subject to leaching losses when lower soil temperatures (less than 40 F) inhibit the microbial conversion of ammonium to nitrate. Lower temperatures also reduce the microbial activity that is responsible for the immobilization of applied N. Late fall, split, or spring applied N is also recommended when residues from previous grain or mature corn crops are returned to the soil in early fall. Early spring N applications are more effective for increasing grain protein for irrigated hard red winter triticale. Nitrogen applied after the boot stage will contribute more to grain protein than to yield. Most triticale varieties respond in a similar way to N. However, varieties differ in their tolerance of high N rates. High N contributes to lodging of varieties with poor straw strength.

PHOSPHORUS (P)
Triticale requires little phosphorus compared to the P requirements of other crops although minimum soil levels are necessary for maximum production. Adequate P is especially necessary for winter hardiness. Soil tests can indicate whether soils require phosphorus fertilization for maximum triticale production. Soil samples are taken from the 0- to 12-inch depth. Broadcast plowdown, broadcasts seedbed incorporation or drill banding low rates of P with seed are effective methods of application. Drill banding may reduce the fertilizer P required. Drill banding high rates of P, especially ammonium phosphate fertilizers, can cause seedling damage. For more detailed discussion of banding, refer to PNW 283, "Fertilizer Band Location for Cereal Root Access."

POTASSIUM (K)
Triticale has a lower requirement for K compared to sugarbeets, corn or potatoes. Soil tests can be useful indicators of the need for K. Potassium should be incorporated during seedbed preparation.

SULFUR (S)
Sulfur requirements for triticale will vary depending on soil texture, previously incorporated crop residues, leaching losses, S content of irrigation water and S soil test. Triticale irrigated with Snake River water should not experience S shortages. Soils low in S (less than 10 ppm S04-S in the plow layer or 8 ppm in the 0- to 12-inch depth) should receive 20 to 40 pounds of S per acre. Sulfur deficiency appears as a general yellowing of the plant early in the season and looks much like N deficiency. Plant analysis can be a useful means of differentiating between the two deficiencies. An N to S ratio of 17 in whole plant tissues is generally used for diagnosing sulfur deficient triticale. Sulfur

deficient triticale has also been known to contain high nitrate nitrogen (N03-N) concentrations.

MICRONUTRIENTS
Micronutrients have not been shown to be limiting triticale production and "shotgun" application of micronutrient mixtures containing boron (B), manganese (Mn), iron (Fe) and copper (Cu) "for insurance" have not been shown to be responsive and are not suggested.
GENERAL COMMENTS
Avoid a heavy first irrigation on spring cereals to prevent water logging, reduced tillering and N leaching.

Wheat, Spring, S-ID, Irrigated
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SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.
GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.
THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO3-N) and (NH4-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF

SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Adequate N is necessary for maximum production of irrigated spring wheat. The amount of fertilizer N required to produce the maximum economic return depends on many factors. These factors include the yield estimate, amount of inorganic N remaining from the previous crop, mineralizable N, other N sources, and the previous crop residues.

TOTAL N REQUIREMENTS BASED ON ESTIMATED YIELD - Fertilizer N rates should correspond to the yield growers can reasonably expect for their soil conditions and management. Historical yields for a specific field or area will generally provide a fair approximation of yield potential, given the grower's traditional crop management. Projected changes in crop management (water management, variety, lodging control, disease and weed control) designed to appreciably increase or reduce production may require adjustment of yield estimates. Areas of fields known to differ considerably in yield, based on previous long-term observations or yield mapping, may also require adjustment of the total N required. The available N from all sources required to produce a bushel (60 pounds) of irrigated spring wheat depends on several crop management practices. Factors such as weed, insect, and disease control as well as irrigation, planting date, water management, and soil type can influence the N required for maximum yield. Results of field trials suggest that two pounds of available N per bushel are required for irrigated spring wheat ranging in yield from 80 to 120 bushels (bu) per acre. Nitrogen requirements per bushel may be greater for yields below 80 bu per acre, but less than two pounds N per bu for yields above 120 bu per acre.

AVAILABLE NITROGEN - Available nitrogen in the soil includes inorganic N measured as nitrate (NO_3 -N) and ammonium (NH_4 -N), mineralizable N (released from organic matter during the growing season), N credits from previous cropping or manures, and in some cases the N in irrigation water. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

INORGANIC NITROGEN - Residual soil inorganic nitrogen (NO_3, NH_4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Research indicates that soil test inorganic N is used as effectively as fertilizer N. Ammonium N (NH_4-N) is generally low in spring preplant soil samples and thus contributes little to available N. However, NH_4-N should be determined along with NO_3-N when there is reason to expect appreciable NH_4-N from previous ammonium N fertilizer applications. To convert soil test NO_3-N and NH_4-N values to pounds (lb) N per acre, sum the N expressed in parts per million (ppm) for each foot increment of sampling depth and multiply times four. A preplant soil sample is often only collected from the first foot of soil. Although this information is not as complete and reliable as would be provided by deeper sampling, residual N measurements from the first foot of soil can be combined with estimates of residual N in the second foot to predict N requirements for irrigated spring wheat. Preplant soil test NO3-N in the second foot of the soil is commonly only one-half to two-thirds as high as in the first foot of soil, unless previous crop irrigation or over winter precipitation has leached N from the surface foot. Basing N rates on estimates rather than actual measurements of residual N in the second foot increases the risk of recommending either too little or too much N.

NITROGEN FROM PREVIOUS CROP RESIDUE - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of residue returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, (Wheat Straw Management and Nitrogen Fertilizer Requirements). Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of spring wheat. Sweet corn residues typically are higher in N content than mature field corn residues. In addition, they are returned to the soil earlier and decompose more rapidly, therefore releasing more N to subsequent spring wheat than mature corn stalks. Legume residues are typically rich in N and can release appreciable N for spring wheat. Bean and pea residues are fairly rapidly decomposed and the N release from them should be reflected in the preplant spring soil test for N. Alfalfa residues decompose less rapidly and the N release is not typically indicated by the preplant soil test.

MINERALIZED NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. Measurements of mineralizable N for spring cereals typically range from 30 to 60 lb per acre. Unless the capacity of a specific soil to release N is known, use a midpoint mineralizable N value of 45 lb N per acre for irrigated spring wheat. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, organic matter does not accurately predict the amount of N that is mineralized in southern Idaho irrigated soils.

NITROGEN FROM MANURE AND WATER - Fields used for spring wheat occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources can be appreciable and should be taken into consideration when estimating available N. Manures can vary in nutrient content depending on the animal source, how the manure is processed, and the quality and quantity of bedding material included. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content. For more detailed information on animal manures and their nutrient contributions to soils, refer to PNW 239, (How to Calculate Manure Application Rates in the Pacific Northwest). Irrigation waters other than lagoon effluents can also contain appreciable N. While most well and surface waters used for irrigation have low N concentrations, irrigation waters that receive appreciable return flows from other districts are likely to be higher in N. To convert the N content of each acre foot of irrigation water applied to the lb N per acre fertilizer equivalent, multiply the ppm or milligrams per liter (mg/l) N concentration by 2.7. Preplant applied N is easily leached beyond developing seedling root systems with early season irrigation. If early season irrigation is necessary to ensure proper vegetative development, consider reducing the time for each set. Set time can be lengthened as the root system develops more fully. Nitrogen located below the developing root system is not taken up as readily by the plant or used as effectively for yield.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, several available N components must be estimated: (1) total N needed for a given yield, (2)mineralized N, (3) inorganic N (NO_3 + NH_4) as measured by the soil test, (4) previous crop/residue management, and (5) manuring practice or irrigation water N concentration.

NITROGEN AND LODGING - Irrigated spring wheat is more susceptible to lodging at high available N levels than winter wheat. Lodging can reduce both grain yield and quality, as well as increase harvest costs. Varieties differ in straw strength, plant height, and their susceptibility to lodging. For descriptions of varieties and their susceptibility to lodging, refer to PR327, (2000 Idaho Certified Seed Selection Guide for Some Varieties of Spring Wheat). Ethephon (Cerone ®)is a growth regulator commonly used to shorten small grains, stiffen straw, and reduce lodging. Growers should consider using this growth regulator for wheat in soils with high available N if lodging is historically a problem.

MANAGING NITROGEN FOR HIGH PROTIEN HARD WHEAT - The hard wheat market, both red and white, often pays a premium for high protein. Hard spring wheat varieties can differ in grain protein. However, the most critical factor for producing high protein irrigated wheat is the amount and timing of N fertilization. To produce high protein wheat, first determine the total fertilizer N required to maximize yield. High protein generally is not realized unless available N matches or exceeds that required for maximum yield. The nitrogen applied for maximizing yield should be applied preplant. Split applications of N can increase wheat protein, but even split applied N may not raise protein to acceptable levels if the total N available is not sufficient for maximum yield. Between boot and flowering is the best time to influence grain protein with delayed applications. The optimum N rate for increasing protein to 14 percent may vary depending on the final yield. Higher yields increase and lower yields reduce the optimal delayed N rate. Flag leaf N testing can be useful for determining the need for later applied N. Research indicates that there is little protein increase with subsequent applied N when flag leaf total N concentration at heading is 4.2 to 4.3 percent or greater. The required N rate increases as flag leaf N values decrease below the critical value. If flag leaf N at heading is above 3.8 percent, no more than 40 lb N per acre should be needed to increase protein to 14 percent. If flag leaf N is below 3.8 percent, higher N rates may be needed.

PHOSPHORUS (P)

Irrigated spring wheat requires adequate soil P for maximum economic yields. Soil testing for P provides a reasonable estimate of available P. Optimum P fertilizer rates depend on both soil test P and soil lime content. Plant maturity may be delayed when soil test P concentrations are low and free lime content is greater than 10 percent. However, grain yields are usually unaffected when the growing season is sufficient. When banding an ammonium P source (11-52-0) at rates above 20 lb per acre, separate the seed and the fertilizer material by two inches to avoid seedling damage from salts. For a detailed discussion of banding refer to PNW 283, (No-Till and Minimum Tillage Farming: Fertilizer Band Location for Cereal Root Access). Incorporate P fertilizer during seedbed preparation. Solution P, such as ammonium polyphosphate, may be applied through a sprinkler irrigation system. Check the compatibility of the irrigation water and the P material. If precipitates form, decrease the fertilizer concentration or increase the injection time.

POTASSIUM (K) AND CHLORIDE (Cl)

Soil test K is a reasonable indication of available K in southern Idaho soils. Incorporate K during seedbed preparation. Potassium chloride increases yields where take-all root rot is prevalent, regardless of the soil test K level. This response is due primarily to the chloride component. Wheat yield may also increase when not infected with take-all if extractable soil Cl is below 30 lb per acre in the first two feet. Low soil Cl has been associated with physiological leaf spot. Soil Cl can be measured with a soil test. If soil test Cl is less than 8 ppm for the first two feet combined, apply 40 lb Cl per acre in the form of potassium chloride. Do not drill band Cl with the seed as germinating seed may be injured by excessive salts.

SULFUR (S)

Sulfur fertilizer requirements for spring wheat depend primarily on the S content of irrigation water and the S soil test. Coarse-textured soils are more likely to be low in S than fine-textured soils. Wheat irrigated with Snake River water or waters consisting of significant runoff from other fields should not require fertilizer S. Soils should be tested for S to a depth of two feet as the available form of S, or sulfate, is mobile. Soils low in S (less than 35 lb per acre in the 0-to 24-inch depth) should receive 20 to 40 lb of S per acre. Use S fertilizers containing readily available sulfate rather than elemental S to rapidly correct S shortages.

MICRONUTRIENTS

Spring wheat yield responses to iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), and other micronutrients are rarely observed in southern Idaho. Micronutrient applications may be needed occasionally on severely scraped or eroded areas.
Contact your County Extension Agent if you have any questions regarding the interpretation of this information or for further information on your local needs.

The above fertilizer guidelines are based on relationships established between University of Idaho soil test and crop yield response research. In this research, crop response to fertilizers was evaluated at several sites where the response to fertilizer differed. The recommendations reflect the general or overall response to fertilizers at specific soil test values and the response in individual fields can differ appreciably from the general table recommendation. Some sites will require less than the general recommendation, other sites more. Unfortunately, the science has not developed to the point where the table recommendations can account for all the unknown variables influencing the effectiveness of applied fertilizers at individual sites. The table fertilizer recommendations can only be used as general guides rather than specific recommendations for each and every field.

Furthermore, soil variability can sharply reduce the accuracy composite soil test values for individual fields. That is why large contiguous areas within fields should be sampled separately when they are known to differ in crop growth or soil characteristics known to influence the response to fertilizer. But soil variability frequently does not occur conveniently in large areas that can be sampled separately or fertilized differently. The fertilizer recommendations in most cases do not account for this variability. Soil test based recommendations may be excessive in some field areas and inadequate in other areas of the same field. The recommendations then will be appropriate only to the degree that the composite soil test values for fields actually represent the field. Thus, for fields that are highly variable, the fertilizer recommendations should be considered conservative estimates of fertilizers needed. All the more reason to consider the table fertilizer recommendations as general guides rather than specific recommendations for each and every field.

The fertilizer rates suggested in the tables will support above average yields if other factors are not limiting production. Therefore the recommendations assume that good crop management practices will be used, i.e. insect, disease, and weed control. Nutrient requirements can be met using either commercial fertilizers or equivalent organic matter sources, such as manure or compost, provided their nutrient content and relative availability are known or can be estimated from published literature. Soil test based recommended rates will not be appropriate if the soil samples are improperly taken or do not represent the area to be fertilized. For nitrogen in particular, recommendations will be most accurate when crop history is taken into account and projected yields are reasonable estimates based on long term records.

General Comments:

- Over irrigation and nutrient loss is a hazard. Optimum irrigation management is necessary to meet crop water use needs and avoid loss of nutrients through leaching beyond the root zone and runoff with irrigation tail water.

- Nitrogen leaching is particularly a concern on sandy soils.Optimum management may require split Nitrogen applications to meet crop needs.

- Weed, insect, and disease control significantly influence the efficiency and effectiveness of your fertilizer applications and ultimately crop yield and farm profitability.

- Phosphorus, potassium, and zinc nutrients can be effectively fall-applied as they are not readily leached over winter.

- Phosphorus can be budgeted for a crop rotation.

• If you have questions regarding the interpretation of this information, please contact your Extension Agricultural agent, Crop consultant, or your commodity company fieldman.

• Both farm profitability and water quality can be improved with efficient nutrient use. The following are recommendations in nutrient management, which will optimize nutrient use for crop production while protecting water quality:

1) Avoid the application of nutrient sources in close proximity to streams, wetlands, drainage ditches, areas of very shallow soils, and sinkholes.

2) Accurately calibrate nutrient application equipment to insure that recommended rates are applied.

3) Nitrogen recommendations for many crops are based on yield goals for the crops. It is important to establish realistic yield goals for each field based upon historical yield data, county averages, and your management practices to avoid unnecessary fertilizer costs and minimize potential water quality impairments.

Appendix D: SOIL TEST DATA

Field: No Data **Date of Test:** No Data

Parameter	Units	0-12"	12-24"	18-24"
Soil Texture		No Data	No Data	
EC	mmhos	No Data	No Data	
PH		No Data	No Data	
%Lime	%	No Data	No Data	
OM	%	No Data	No Data	
CEC	meq	No Data	No Data	
Nitrate-N	ppm	No Data	No Data	
Ammonia-N	ppm	No Data	No Data	

P	ppm	No Data	No Data	No Data
K	ppm	No Data	No Data	
Z	ppm	No Data	No Data	
Mn	ppm	No Data	No Data	
Fe	ppm	No Data	No Data	
Cu	ppm	No Data	No Data	
Ca	ppm	No Data	No Data	
Mg	ppm	No Data	No Data	
Na	ppm	No Data	No Data	

Export Agreement for Waste

I, _____Silverleaf Farm_____, with a physical address of _____9288 Silverleaf Rd, Emmett, ID 83617_____ agree with Treasure Valley Land & Livestock to accept and take delivery of Solid Stack(s) from Treasure Valley Land & Livestock during the farming season. I intend to apply the bionutrient to some or all of the farm ground owned or leased by me in the amounts consistent with best management farming practices. I presently own and/or lease _________110_________ acres of farm ground.

Bionutrient	**N (lb/ton)**	**P2O5 (lb/ton)**	**K2O (lb/ton)**
Solid Stack(s)	474	339	725

______________________________ ______________

Signature Date

PRODUCER SUMMARY

Facility Summary

Treasure Valley Land and Livestock is an existing dairy facility owned and operated by Terry Jones and is located at 5888 Sandy Ave in Emmett Idaho T.7N, R.3W, Sec 12. This Nutrient Management Plan has been written for 300 mature dairy cows even though it is starting out with considerably less. All livestock is housed in open lots and bedded with long straw during the winter months. This facility has 183 farmable acres available using mostly a corn/alfalfa crop rotation. All wastewater can be land applied through gated pipe and hand and wheel lines. As the facility increases in size with animal units, solids may need to be exported to a third party. Wastewater from the milking barn is gravity fed to the liquid waste storage pond. This facility is properly sized and has sufficient containment for 180 days of storage. This Nutrient Management Plan is a working document and will be upgraded as the facility operation changes or expands.

Resource Concerns

Treasure Valley Land and Livestock is located in the 17050122 hydraulic unit in the Payette watershed basin. This stream segment is water quiality limited because of a water quality parameter preventing the attainment of the "Fishable/Swimable goal of the Clean Water Act. Resource concern for this dairy would be surface water. Most of the fields are surface irrigated with gated pipe and all runoff is contained on the property.

Manure Application Rate Requirement By Year

FIELD: 1 / Owl 12 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93

		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 2 / Rabbit 11 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 3 / Cottonwood 27 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92

		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

FIELD: 5 / Pheasant 14 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		0 T/ac	41 %				
		N	0	31	N	0	N	31
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		0 T/ac	41 %				
		N	0	31	N	7	N	38
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		0 T/ac	41 %				
		N	0	31	N	7	N	38
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		0 T/ac	41 %				
		N	0	31	N	17	N	48
		P	0	93			P	93
		K	0	183			K	183

FIELD: 6 / Skunk 34 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		13 T/ac	59 %				
		N	26	18	N	0	N	44
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		12 T/ac	59 %				
		N	26	18	N	14	N	58
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		12 T/ac	59 %				

		N	26	18	N	14	N	58
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		12 T/ac	59 %				
		N	26	18	N	24	N	68
		P	40	53			P	93
		K	86	103			K	189

FIELD: 7 / Snake 43 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization		Total	
Wheat, Spring, S-ID, Irrigated(2006)	Y		22 T/ac	0 %				
		N	44	0	N	45	N	89
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2007)	Y		21 T/ac	0 %				
		N	44	0	N	64	N	108
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2008)	Y		21 T/ac	0 %				
		N	44	0	N	54	N	98
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2009)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2010)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated(2011)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149
Wheat, Spring, S-ID, Irrigated(2012)	Y		21 T/ac	0 %				
		N	44	0	N	69	N	113
		P	70	0			P	70
		K	149	0			K	149

FIELD: 8a / Upper Turkey 20 acres

Name	Man App		Solid Stack(s)	Waste Storage Pond(s)	Mineralization	Total

			17 T/ac	0 %				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2006)	Y	N	33	0	N	0	N	33
		P	52	0			P	52
		K	112	0			K	112
			15 T/ac	0 %				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2007)	Y	N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
			15 T/ac	0 %				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2008)	Y	N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
			15 T/ac	0 %				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2009)	Y	N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
			15 T/ac	0 %				
Corn, Field, Silage, S-ID, Irrigated(2010)	Y	N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112
			15 T/ac	0 %				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2011)	Y	N	33	0	N	18	N	51
		P	52	0			P	52
		K	112	0			K	112

FIELD: 8b / Lower Turkey 13 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
			17 T/ac				
Corn, Field, Silage, S-ID, Irrigated(2006)	Y	N	33	N	0	N	33
		P	52			P	52
		K	112			K	112
			15 T/ac				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2007)	Y	N	33	N	8	N	41
		P	52			P	52
		K	112			K	112
			15 T/ac				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2008)	Y	N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
			15 T/ac				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2009)	Y	N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
			15 T/ac				
Alfalfa, Hay, Cut Mature, S-ID, Irrigated(2010)	Y	N	33	N	18	N	51
		P	52			P	52
		K	112			K	112
			15 T/ac				
Corn, Field, Silage, S-ID, Irrigated(2011)	Y	N	33	N	18	N	51
		P	52			P	52
		K	112			K	112

FIELD: 9 / Bull 9 acres

Name	Man App		Solid Stack(s)	Mineralization		Total	
Corn, Field, Silage, S-ID, Irrigated(2006)	Y		29 T/ac				
		N	59	N	0	N	59
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2007)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2008)	Y		28 T/ac				
		N	59	N	23	N	82
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2009)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2010)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200
Corn, Field, Silage, S-ID, Irrigated(2011)	Y		28 T/ac				
		N	59	N	33	N	92
		P	93			P	93
		K	200			K	200

Minimum Acres Required for Manure Application

Manure Group	Acres
Solid Stack(s)	226
Waste Storage Pond(s)	31

The acreage in the table is based on an average crop uptake of 100 lbs P_2O_5 per acre. These acreage numbers are for estimating export acreage needed.

Hydraulic Balance

Wastewater applications should begin and end with the irrigation season. Depending on weather and soil conditions, applications outside of this window may be allowed. Lagoons must be emptied in the fall. Fall application of effluent must be completed prior to November 15th. No application will be allowed to frozen or snow covered ground. Spring applications prior to the start of the irrigation season may be allowed if moisture or nutrients are needed to enhance crop production. You must contact the Department of Agriculture, Dairy Bureau (208) 332-8550 prior to any wastewater application outside of the irrigation season. The need for wastewater application outside of the irrigation season will be evaluated on a case by case basis. Factors considered in granting approval will be but are not limited to the following; date, existing and forecasted weather conditions, moisture content of the soil, water holding capacity of the soil, frost layers in the soil, and crop needs.

Annual Soil Test

Annual soils tests must be taken every year from every field to determine a commercial fertilization rate. If commercial fertilizer isn't applied (for a perennial crop), annual soil samples are not required. If you do not apply commercial fertilizer, a complete soil analysis will need to be conducted initially to determine the nutrient baseline.

Record Keeping

For each field keep a record of annual manure and chemical fertilizer applications. Include nutrient source, date, time, rate and application method. Records must also be kept on exported manure. These records should include the name of the person receiving the manure, source, and quantity of the manure, and the export date. These records are to be kept for a minimum of five (5) years and must be made available for review upon request by ISDA personnel.

Facility Testing Requirements

Regulatory soil samples will be required from each field every three to five years. These samples must be taken from 18-24" for fields listed as a groundwater concern and from 0-12" for fields listed as surface water concern.

Recommendations for Best Management Practices

No Data

Treasure Valley Land & Livestock
ANALYSIS OF RESOURCE CONCERNS

INTRODUCTION

The purpose of this nutrient management plan is to meet agricultural production goals and to certify that manure and nutrients are properly managed to minimize adverse impact to surface or groundwater. Plans are written in cooperation with the producer to:

1) Assure proper containment of animal manure and process waste water.

2) Assess resource concerns which exist on the property.

3) Budget nutrient sources to optimize crop water and nutrient needs. Nutrient sources include commercial fertilizers, animal manure, mineralization of previous crop soil organic matter, accounting of residues, and irrigation water.

4) When applicable, assess irrigation water management to minimize movement of nutrients beyond the root zone or with runoff.

If animal manure and/or commercial fertilizers are not properly managed, contaminants may negatively impact surface and/or groundwater. Some water resource contaminants associated with poorly managed animal manure and fertilizers are:

Phosphorus in the soil readily adsorbs to soil particles; thus, erosion of soil by surface runoff is the general mode of phosphorus transport. Even at very low concentrations, phosphorus can result in plant and algae blooms in surface water bodies. Alga blooms are a nuisance to boaters, irrigators, and others. Toxins released by certain algae can be lethal to livestock or other animals that drink the water. Dissolved oxygen in the water is depleted as algae die and decompose, sometimes causing fish kills.

Nitrogen in the form of nitrate (NO_3^-) is highly water-soluble and will move with water, particularly down the soil profile past the root zone if not utilized by plants (thus becoming a groundwater contamination issue).Nitrates are toxic to infants under 6 months, and to livestock at high concentrations. In surface water, excess nitrogen, like phosphorus, can result in nuisance plant and algae growth.

Organic matter in high load decreases dissolved oxygen in a surface water body when it decomposes. Low levels of dissolved oxygen is harmful or even fatal to fish and other aquatic life.

Bacteria and microorganism illnesses (pathogens) potentially transmitted through water by animal manure include Giardia, Typhoid Fever, Cryptosporidium, and Cholera. Pathogens from animal waste can negatively impact surface and groundwater quality.

FACILITY DESCRIPTION

Owner Information

Owner (1): Terry Jones
Address: 5888 Sandy Ave, Emmett, ID
Phone: [redacted]

Location

Site Map: Facility site plan illustrated in Figure 1

Soil Conservation District:	Gem
County:	Gem
Watershed Basin:	Payette (USGS Hydrologic Unit Code # 17050122)

ANALYSIS OF RESOURCE CONCERNS

Farm Resource Concerns

Treasure Valley Land & Livestock is located in a watershed containing water quality limited stream segments listed according to the Clean Water Act. Stream segments are listed because a water quality parameter prevents the attainment of the "Fishable/Swimmable" goal of the Clean Water Act.

WATERBODY	BOUNDARIES	BACT	CHAN STAB	DO	FLOW ALT	HAB ALT	MET HG	MET	NH3	NUTR	O_G	ORG	PEST	PH	SAL	SED	TDG	TEMP	UNKN	*
Big Willow Cre	Rock Creek to Payette River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	☐
Bissel Creek	Headwaters to Payette River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	☐
Black Canyon R	N/A	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	☐
Payette River	Black Canyon Dam to Snake River	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	☑
Soldier Creek	Headwaters to Squaw Creek	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	☐

Treasure Valley Land & Livestock is <u>not</u> located in a critical Nitrate-Nitrogen management area . Nitrate Management Areas are designated based upon ground water quality sampling results. Two priority groups exist as follows:

<u>Priority 1</u> is designated because at least 25% of the ground water sampling locations within the area exceed 5-milligrams/liter nitrate. This is one-half of the maximum contaminant level of 10-milligrams/liter nitrate. This nitrate concentration is considered evidence of significant degradation. Public drinking water systems are required to increase monitoring frequency when this level is reached.

<u>Priority 2</u> is designated because at least 50% of the ground water sampling locations within the area exceed 2-milligrams/liter nitrate. This concentration threshold provides an indication of human-caused (anthropogenic) impacts. The upper limit for naturally occurring (background) concentrations of nitrate is considered to be about 2 mg/l.

Treasure Valley Land & Livestock is located in a sole source aquifer area - Western Snake River Plain Aquifer.

Field Resource Concerns

- **No Resource Concerns -**

Depth Limiting Subsurface Features

Field Name	Subsurface Feature	Depth from Surface (in)
1 / Owl	Water Table	>72
2 / Rabbit	Cobbles	48
	Hard Pan	20
	Water Table	>72
3 / Cottonwood	Water Table	>72
5 / Pheasant	Water Table	>72
6 / Skunk	Cobbles	48
	Hard Pan	20
	Water Table	>72
7 / Snake	Cobbles	47
	Hard Pan	20
	Water Table	>72
8a / Upper Turkey	Cobbles	48
	Hard Pan	20
	Water Table	>72
8b / Lower Turkey	Cobbles	47
	Hard Pan	20
	Water Table	24
9 / Bull	Water Table	>72

Well Testing Results (See back of page):

Well	Date	Hardness	EC	PH	K	Nitrates	Nitrites	NH3	Na	Carbonate	Bicarbonate
No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

ISDA REGULATIONS AND THE IDAHO NUTRIENT MANAGEMENT STANDARD

Nutrient management plans for animal agricultural operations regulated by the Idaho State Department of Agriculture (ISDA) must be approved by the Idaho State Department of Agriculture and must follow the Natural Resource Conservation Service (NRCS) Agriculture Waste Management Field Handbook and the Idaho Nutrient Management Standard. ISDA regulation and the Standard use soil test phosphorus as the indicator for environmental impact from agricultural production practices. The Idaho Nutrient Management Standard is based on a threshold soil test phosphorus level (TH), above which there is no agronomic advantage to application of phosphorus.

The Idaho Nutrient Management Standard categorizes fields as a surface water concern or a groundwater concern. A surface water concern indicates that runoff leaves the contiguous operating unit from normal storm events, rain on snow, frozen ground, or irrigation. The soil phosphorus threshold for a field with a surface water concern is 40 ppm phosphorus for basic soils (pH > 7) tested with the Olsen method; 60 ppm phosphorus for acidic soils (pH < 7) tested with the Bray method; and 6 ppm phosphorus for acidic soils tested with the Morgan method (0-12"Soil Sample Depth).

A groundwater resource concern indicates that runoff does not leave the contiguous operating unit from normal storm events, rain on snow, frozen ground, or irrigation. There are two sub-categories for fields identified as having a groundwater concern. The first category applies to fields with a resource concern within the first five feet of the soil profile. A resource concern could be shallow soils, gravel, cobble, bedrock, high groundwater table, or a drained field. These fields are indicated as a groundwater concern <5'. The soil phosphorus threshold for a field with a groundwater concern <5' is 20 ppm phosphorus for soils tested with the Olsen method; 25 ppm phosphorus for soils tested with the Bray method and 2.5ppm phosphorus for soils tested with the Morgan method (18-24" Soil Sample Depth).

If a field is not classified as having a surface water concern or a groundwater <5' concern, by default it is classified as having a groundwater concern >5'. The soil phosphorus threshold for a field with a groundwater concern >5' is 30 ppm phosphorus for soils tested with the Olsen method; 45 ppm phosphorus for soils tested with the Bray method; and 4.5 ppm phosphorus for soils tested with the Morgan method (18-24" Soil Sample Depth).

Field Phosphorus Threshold

Field	Resource Concern	P Threshold (ppm)	P Threshold Soil Test Depth
1 / Owl	Surface Water	40	0 - 12"
2 / Rabbit	Surface Water	40	0 - 12"
3 / Cottonwood	Surface Water	40	0 - 12"
5 / Pheasant	Surface Water	40	0 - 12"
6 / Skunk	Surface Water	40	0 - 12"
7 / Snake	Groundwater < 5'	20	18 - 24"
8a / Upper Turkey	Surface Water	40	0 - 12"

8b / Lower Turkey	Surface Water	40	0 - 12"
9 / Bull	Surface Water	40	0 - 12"

Farm Location

Idaho Transverse Mercator

Coordinates of the farm center (meters): X = 2287587.57822047, Y = 1420420.68386378

Map Scale: 1 : 47

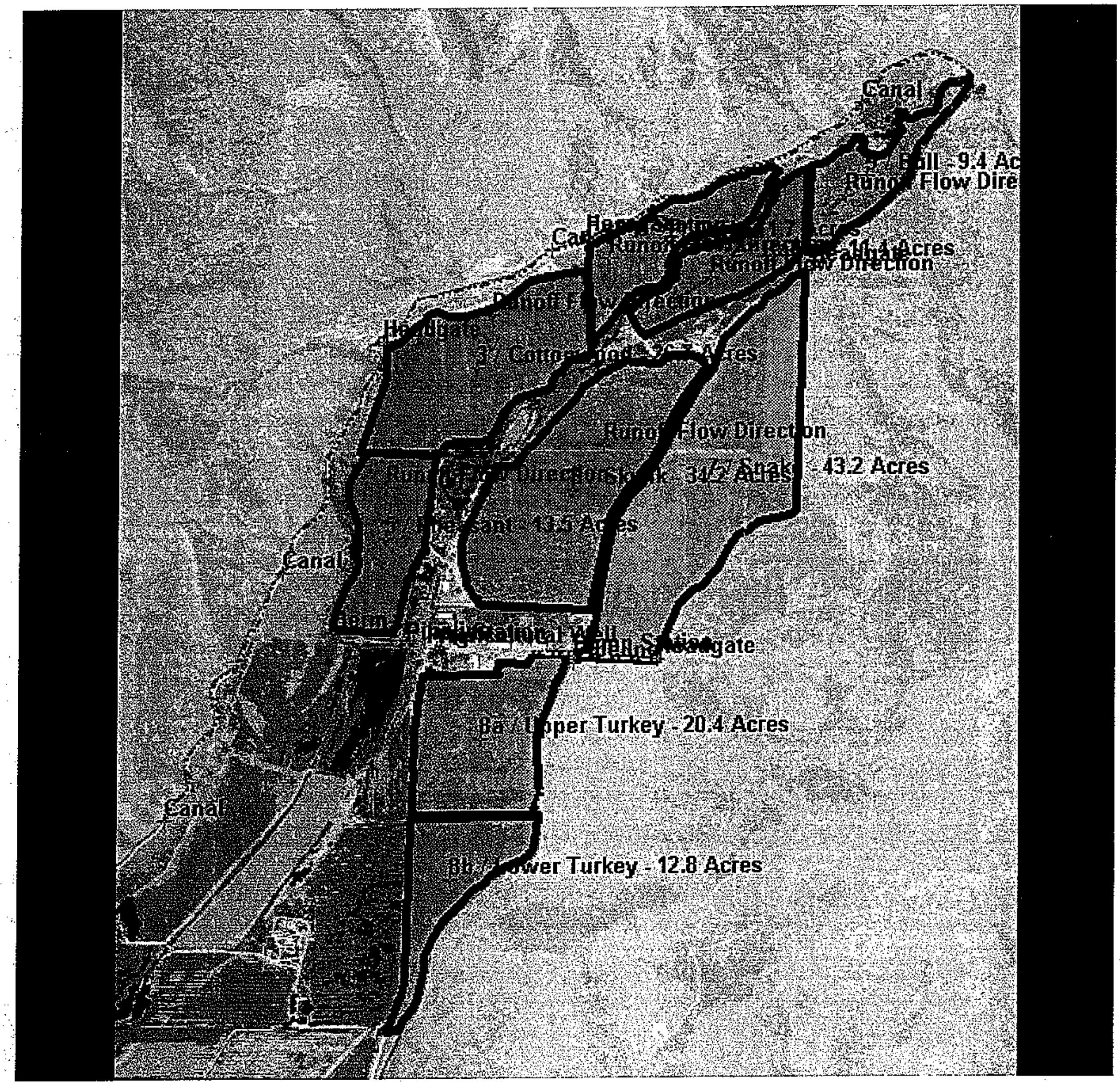

Figure 1. Base Map

Farm Location

Idaho Transverse Mercator

Coordinates of the farm center (meters): X = 2287587.57822047, Y = 1420420.68386378

Map Scale: 1 : 47

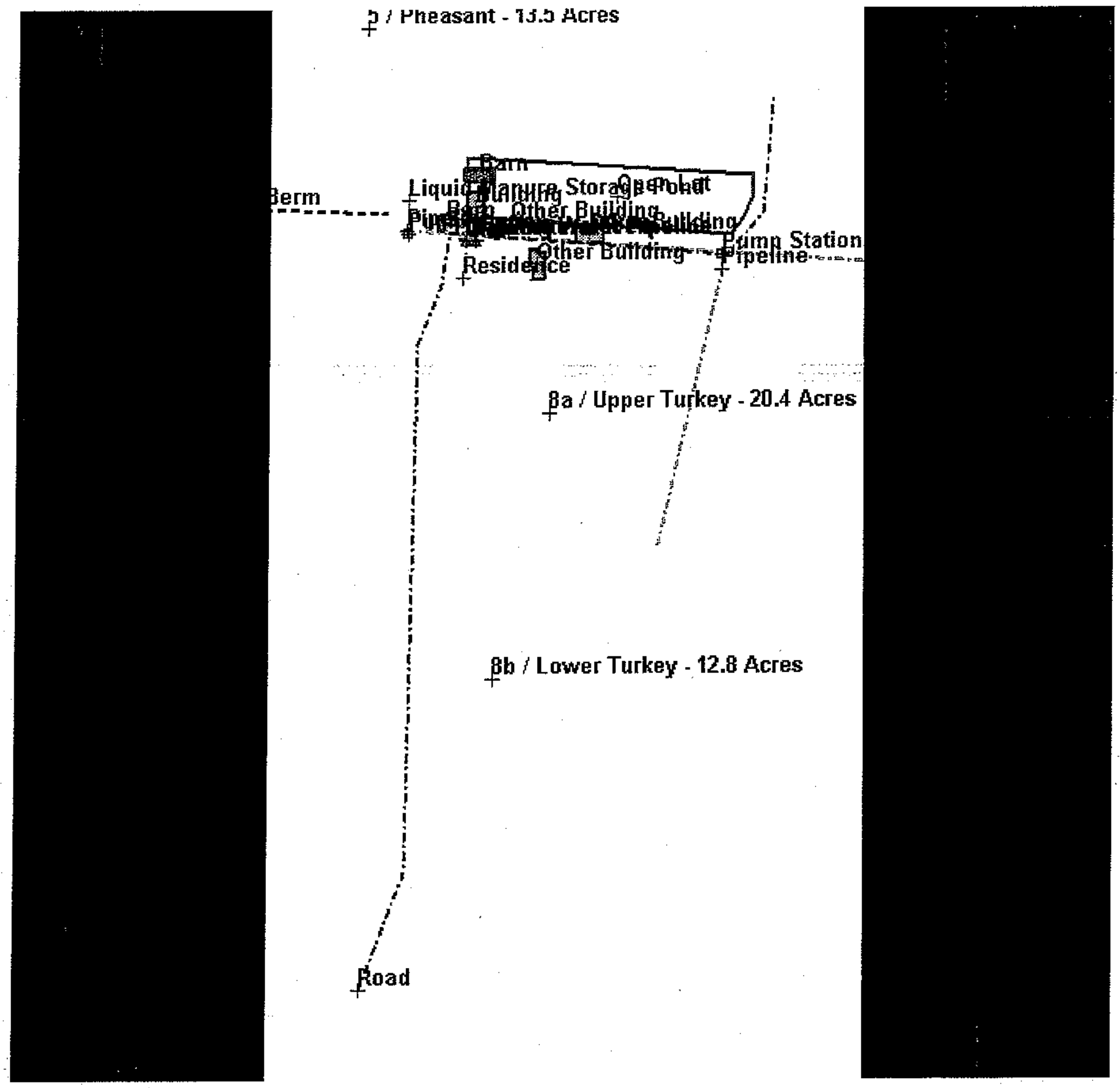

Figure 2. Farmstead Map

ANNUAL NUTRIENT BUDGET

The following crop nutrient budget is based on soil test data and cropping information. It is for one year for the following field and specified crop information:

Nutrient Budget Summary

Field: 1 / Owl **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 2 / Rabbit **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 3 / Cottonwood **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

Field: 5 / Pheasant **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	17		
from Irrigation Water	0		0
Nutrient Balance from above *	222.8	93.4	213.3
Solid Stack(s)	0	0	0
Waste Storage Pond(s)	31	93	183
Estimated Remaining Nutrients Required *	192	0	30
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	192	0	30

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

Field: 6 / Skunk **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		

from Prior Bio-Nutrients	24		
from Irrigation Water	0		0
Nutrient Balance from above *	216.1	93.4	213.3
Solid Stack(s)	26	40	86
Waste Storage Pond(s)	18	53	103
Estimated Remaining Nutrients Required *	172	-1	23
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	172	-1	23

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 7 / Snake **Crop:** Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated **Yield:** 15

	N	P205	K20
Crop Nutrient Requirement	280	91	433
Nutrients From Soil	?		
from Mineralized Nitrogen	45		
from Prior Crops	-5		
from Prior Bio-Nutrients	24		
from Irrigation Water	0		0
Nutrient Balance from above *	215.6	90.7	433.4
Solid Stack(s)	44	70	149
Waste Storage Pond(s)	0	0	0
Estimated Remaining Nutrients Required *	172	21	284
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	172	21	284

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Rate may result in crop nutrient deficit or a potential resource concern.
Acceptable: Sustainable agronomic rate.

Field: 8a / Upper Turkey **Crop:** Alfalfa, Hay, Cut Mature, S-ID, Irrigated **Yield:** 4.6

	N	P205	K20
Crop Nutrient Requirement	183	42	176
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	0		
from Prior Bio-Nutrients	18		
from Irrigation Water	0		0
Nutrient Balance from above *	164.8	42.1	175.5

Solid Stack(s)	33	52	112
Waste Storage Pond(s)	0	0	0
Estimated Remaining Nutrients Required *	132	-10	64
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	132	-10	64

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 8b / Lower Turkey **Crop:** Alfalfa, Hay, Cut Mature, S-ID, Irrigated **Yield:** 4.6

	N	P205	K20
Crop Nutrient Requirement	183	42	176
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	18		
from Irrigation Water	0		0
Nutrient Balance from above *	174.8	42.1	175.5
Solid Stack(s)	33	52	112
Estimated Remaining Nutrients Required *	142	-10	64
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	142	-10	64

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus
Acceptable: Sustainable agronomic rate.

Field: 9 / Bull **Crop:** Corn, Field, Silage, S-ID, Irrigated **Yield:** 23.3

	N	P205	K20
Crop Nutrient Requirement	230	93	213
Nutrients From Soil	?		
from Mineralized Nitrogen	0		
from Prior Crops	-10		
from Prior Bio-Nutrients	33		
from Irrigation Water	0		0
Nutrient Balance from above *	207.4	93.4	213.3
Solid Stack(s)	59	93	200
Estimated Remaining Nutrients Required *	148	0	13
Commercial Fertilizer Application	0	0	0
Final Nutrient Balance *	148	0	13

* Positive values indicate additional nutrients are required; negative values indicate a nutrient surplus

Acceptable: Sustainable agronomic rate.

ANALYSIS OF ANIMAL SYSTEM

WASTE STORAGE AND HANDLING

Livestock Unit Waste Characteristics

Description	Animal	Number	Average Animal Weight	Days Collected	Housing	Bedding Type	Bedding (tons)	Waste (tons)
Milksers	Lactating Cow	250	1,400	365	Open Lot	Long Straw	594	5,426
Dry's	Dry Cow	50	1,400	365	Open Lot	Long Straw	119	1,104

Manure/Biosolid Groups

Manure Group	Storage Type	Application Method	Days to Incorporation	Nitrogen Retention(%)	Annual Volume (ft3)	Annual Weight (tons)
Solid Stack(s)	Manure and Bedding Held in Unroofed Storage	Broadcast, Incorporated deeper than 3 inches	4-7 days	48	203,771	6,663
Waste Storage Pond(s)	Waste Storage Pond, Diluted > 50%	Irrigation	N/A	26	26,253	814

* in Nitrogen Retention % Column means "Overridden Nitrogen Values"

Manure Group		Dry's	Milksers
Waste Storage Pond(s)	**% To Group**	N/A	15
Solid Stack(s)	**% To Group**	100	85

Annual Production of Nutrients

The nutrient values were calculated based on animal weight and nitrogen loss estimates as described in the NRCS Agricultural Waste Management Field Handbook guidelines (1996). The calculations are estimates, and manure testing is recommended for more accuracy, as manure nutrient content varies widely among operations.

Nutrient Distribution on Facility				
	Pounds N	**Pounds P_20_5**	**Pounds K_20**	**% of Total**
Total Nutrients Produced	33827	25655	54284	
Solid Stack(s)	31563	22586	48280	90
Waste Storage Pond(s)	2264	3069	6004	10
Nutrients Exported	474	339	725	1
Nutrients Onsite	33353	25316	53559	99

Comments on Bionutrients
No Comments

Dairy Water Values

Dairy Water Values			
Dairy Process Water:	250	**Milk Parlor Cleaning Water:**	400
Dairy Parlor Water:	200	Hose Volume:	400
Bulk Tank Water:	50	Flush Volume:	0
Cow Prep Water:	0	Deck Flush Volume:	0
Automatic Backflush:	0	Other Volume:	0
Sprinkler Volume:	0	**Holding Pen Cleaning Water:**	200
Manual Cow Prep:	0	Hose Volume:	200
Dairy Equipment Water:	3895	Flush Volume:	0
Compressor Water:	0	Other Volume:	0
Vacuum Pump Water:	0	**Freestall/Alley Flush:**	0
Pre-Cooler Water:	3895	**Excess Water**	
Glycol Chiller Water:	0	Cow Water:	7500
Miscellaneous Equipment Water:	100	Group 1:	-3605
Washing Machine Water:	0	Group 2:	600
Miscellaneous Water:	0		
Milkhouse Water	100	**Total Dairy Water:**	**950**

Bulk Tank(s)		
Bulk Tank ID	Size	Volume
1	5000	100

Comments

Cow Prep Comments:
All cows are pre-dipped with iodone solution and toweled dry. Cows are also post dipped. No water is used for cleaning cows prior to milking.

Holding Pen Comments:
Parlor is washed after each milking. Holding pen is washed once daily.

MANURE STORAGE SUMMARY

Total Annual Liquid Capacity Required				
Bio-Nutrient Group	Recommended Capacity Cubic Feet	% Contained	Storage Days	Storage Vol. Cubic Feet
Waste Storage Pond(s)	26,253	100%	180	12,947
Process Water	46,233	100%	180	22,800

Total Annual Solid Capacity		
Bio-Nutrient Group	Recommended Capacity Cubic Feet	% Contained
Solid Stack(s)	203,771	0%
Milksers	134,129	0%
Dry's	26,871	0%

Existing Storage Containers						
Storage Unit Name	Days Stored	Waste Storage Pond(s)	Solid Stack(s)	Process Water	Milksers - Bedding	Dry's - Bedding
Liquid Waste Pond	180	100%	0%	100%	0%	0%

New Storage Containers Required		
Storage Unit Name	Days Stored	No Data
No Data	@[DaysStored]	No Data

Container Name	Volume (ft3)	Storage Period (Days)	Length	Width	Depth	Slope	Diameter	Existing	Proposed
Liquid Waste Pond	385,333.0	180	500.0	100.0	10.0	2.0	0.0	0.0	0.0

Containment of Housing Facility Waste and Corral Runoff
It is important that water from housing facilities and contaminated runoff from corrals be contained and/or diverted to the lagoon storage system. As stated in the Idaho State Department of Agriculture (ISDA) regulation, a discharge is allowed only under large precipitation events (>25yr, 24hr storm event). Lagoon structures must be properly designed, operated, and maintained to contain all barn wastewater and contaminated runoff from a 25-year, 24-hour rainfall event for the site location and maintained to contain all runoff from accumulation of winter precipitation from a one in five-year winter. Animals confined in the CAFO may not have direct contact with canals, streams, lakes, or other surface waters.

Comments
No Comments

BIO-NUTRIENT EXPORT INFO

Exported Bio-Nutrient Summary					
Bio-Nutrient Group Name	**Amount**	**Consumer**	**Consumer's Address**	**Telephone**	**Acres**
Solid Stack(s)	100	Silverleaf Farm	9288 Silverleaf Rd,Emmett,ID,83617		110

ANALYSIS OF CROPPING SYSTEM

Farming Operation

Total Acres: 183.3

Crop Production History

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Corn

Crop	Yield	Yield Units	N Requirement	P_20_5 uptake	K_20 Requirement
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Average				93	

* Nitrogen and Potassium Requirements assume zero credits.

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Triticale Wheat

Crop	Yield	Yield Units	N Requirement	P_20_5 uptake	K_20 Requirement
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240
Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240
Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated	15	tons/acre	280	90.7	240

Wheat, Spring, S-ID, Irrigated	89	bu/acre	180	48.9	240
Average				70	

* Nitrogen and Potassium Requirements assume zero credits.

THIS IS NOT A FERTILIZER RECOMMENDATION

Crop Rotation Name: Alfalfa Corn

Crop	Yield	Yield Units	N Requirement	P_2O_5 uptake	K_2O Requirement
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Corn, Field, Silage, S-ID, Irrigated	23.3	tons/acre	230	93.4	240
Alfalfa, Hay, Cut Mature, S-ID, Irrigated	4.6	tons/acre	0	42.1	180
Average				52	

* Nitrogen and Potassium Requirements assume zero credits.

Mapped Resource Concern(s)

Field Name	Acres	Resource Concern(s)
No Data	No Data	No Data

ANALYSIS OF IRRIGATION PRACTICES

Irrigation Management

Proper irrigation management depends on factors such as the following.

Irrigation Efficiency: The efficiency with which the irrigation wets the entire crop root zone. This takes losses that occur from evaporation, runoff and deep percolation.

Crop Evapotranspiration Rate (ET): The combined rate at which water from the soil profile is evaporated into the atmosphere and transpired from the crop. The rate is expressed in units of inches/day.

Management Allowable Depletion (MAD): The percentage of water, which can be depleted from the soil before the crop, experiences water deficiency stress.

Available Water Holding Capacity in the Soil (AWH): The amount of water the pores in the soil profile can hold against gravity. The AWH is expressed as inches of water per inch of soil.

Crop Rooting Depth: The depth in the soil profile to which the crop roots can penetrate.

Surface Irrigation Summary

Field Name: 1 / Owl

[redacted]

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	130.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	1.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	.2	320.0	3.3	4.2	95.8
Jul	7.0	24.0	.5	320.0	7.7	4.2	95.8

Aug	7.0	12.0	.9	160.0	6.3	8.2	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 2 / Rabbit

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	1320.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	4.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	2.5	31.5	3.3	16.3	83.3
Jul	7.0	24.0	5.4	31.5	7.7	15.8	83.3
Aug	7.0	24.0	4.4	31.5	6.3	16.0	83.3
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 3 / Cottonwood

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	350.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	.7	118.9	3.3	8.2	91.7
Jul	7.0	24.0	1.4	118.9	7.7	8.2	91.7
Aug	7.0	24.0	1.2	118.9	6.3	8.2	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 5 / Pheasant

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	1000.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	3.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.9	41.6	3.3	12.3	87.5
Jul	7.0	24.0	4.1	41.6	7.7	12.0	87.5
Aug	7.0	24.0	3.4	41.6	6.3	12.1	87.5
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Surface Irrigation Summary

Field Name: 6 / Skunk

Date of Initial Irrigation:	6/1/2007

Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	800.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.5	52.0	3.3	8.2	91.7
Jul	7.0	24.0	3.3	52.0	7.7	8.0	91.7
Aug	7.0	24.0	2.7	52.0	6.3	8.1	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Hand or Wheel Line Irrigation Summary

Field Name: 8a / Upper Turkey

Irrigation System Efficiency:	.0 %
Date of Initial Irrigation:	4/15/2007
Current Crop	Alfalfa, Hay, Cut Mature, S-ID, Irrigated
System Flow Rate:	398.0 gpm
Estimated Runoff:	0 %

Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	19.9	1.6	16.8	.0
May	28.0	21.0	19.9	3.9	17.5	.0
Jun	28.0	21.0	19.9	5.6	15.8	.0
Jul	28.0	21.0	19.9	8.0	14.1	.0
Aug	28.0	21.0	19.9	6.4	13.0	.7
Sep	.0	.0	.0	3.4	.0	2.8
Oct	.0	.0	.0	.6	.0	3.3

Hand or Wheel Line Irrigation Summary

Field Name: 8b / Lower Turkey

Irrigation System Efficiency:	.0 %
Date of Initial Irrigation:	4/15/2007
Current Crop	Alfalfa, Hay, Cut Mature, S-ID, Irrigated
System Flow Rate:	398.0 gpm
Estimated Runoff:	0 %

Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	31.7	1.6	28.6	.0
May	28.0	21.0	31.7	3.9	29.3	.0
Jun	28.0	21.0	31.7	5.6	27.6	.0
Jul	28.0	21.0	31.7	8.0	25.9	.0
Aug	28.0	21.0	31.7	6.4	24.8	.8
Sep	.0	.0	.0	3.4	.0	2.9
Oct	.0	.0	.0	.6	.0	3.2

Surface Irrigation Summary

Field Name: 9 / Bull

Date of Initial Irrigation:	6/1/2007
Current Crop	Corn, Field, Silage, S-ID, Irrigated
Furrow Flow Rate	45.0 gpm
Delivery Method	Gated Pipe
Furrow Length	800.0 ft
Furrow Spacing	2.5 ft
Time to Reach End of Furrow	2.0 hours

Month	Days Between Irrigation	Set Time (hours)	Irrigation Application Efficiency	Water Applied (in)	Net Irrigation Requirement (in)	Deep Perc.	Runoff Index
Mar	.0	.0	.0	.0	.0	.0	.0
Apr	.0	.0	.0	.0	.0	.0	.0
May	.0	.0	.0	.0	1.2	.0	.0
Jun	7.0	24.0	1.5	52.0	3.3	8.2	91.7
Jul	7.0	24.0	3.3	52.0	7.7	8.0	91.7
Aug	7.0	24.0	2.7	52.0	6.3	8.1	91.7
Sep	.0	.0	.0	.0	2.1	.0	.0
Oct	.0	.0	.0	.0	.0	.0	.0

Hand or Wheel Line Irrigation Summary

Field Name: 7 / Snake

Irrigation System Efficiency:	.0 %
Date of Initial Irrigation:	4/15/2007
Current Crop	Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated
System Flow Rate:	397.7 gpm
Estimated Runoff:	0 %

Month	Days Between Irrigation	Days to Irrigate Field Completely	Water Applied Per Irrigation (in)	Net Irrigation Requirement (in)	Deep Perc.	Irrigation Deficit (in)
Mar	.0	.0	.0	.0	.0	.0
Apr	28.0	21.0	9.4	1.1	7.1	.0
May	28.0	21.0	9.4	4.2	7.1	.0
Jun	28.0	21.0	9.4	.0	7.0	.0
Jul	28.0	21.0	9.4	.0	9.4	.0
Aug	28.0	21.0	9.4	.0	9.4	.0
Sep	.0	.0	.0	.0	.0	.0
Oct	.0	.0	.0	.0	.0	.0

Appendix A: ANALYSIS OF SOIL CHARACTERISTICS

Soil Survey (USDA NRCS) information was used to describe the soil variations across each field. **This is not absolute** and may vary for each specific situation. The soil map has broad areas that have distinctive pattern of soils, relief, and drainage. Each map unit on the soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. Because the minor soils are not described in the following summary, the combined acreage for all major soils will be less than the acreage for each field.

Table 1. Soil type across each field

Field Name	Soil Type	Percentage	Approximate Acreage	Surface Texture[1]
1 / Owl	HARPT	100	8.75	COSL
	LANKTREE	100	0.08	L
	HARPT	100	2.91	COSL
2 / Rabbit	HARPT	100	8.21	COSL
	HARPT	100	1.77	L
	LOLALITA	100	1.37	COSL
	POWER	60	0.02	SIL
	PURDAM	40	0.01	SIL
3 / Cottonwood	HARPT	100	19.86	COSL
	LANKTREE	100	0.01	SL
	HARPT	100	0.74	COSL
	HARPT	100	6.13	L
5 / Pheasant	HARPT	100	82.98	L
6 / Skunk	LOLALITA	100	14.19	COSL
	POWER	60	28.56	SIL
	PURDAM	40	19.04	SIL
	POWER	60	48.95	SIL
	PURDAM	40	32.63	SIL
7 / Snake	LANKTREE	100	15.28	L
	LANKTREE	65	10.65	L
	CHILCOTT	25	4.1	SIL
	LOLALITA	100	0.48	COSL

	POWER	60	0.01	SIL
	PURDAM	40	0.01	SIL
	POWER	60	6.55	SIL
	PURDAM	40	4.36	SIL
	HARPT	100	0.07	COSL
8a / Upper Turkey	POWER	60	3.2	SIL
	PURDAM	40	28.07	SIL
	POWER	60	42.1	SIL
	PURDAM	40	19.04	SIL
	PURDAM	40	2.13	SIL
	POWER	60	28.56	SIL
8b / Lower Turkey	DRAPER	100	0.9	L
	POWER	60	7.12	SIL
	PURDAM	40	4.74	SIL
9 / Bull	LOLALITA	100	0.16	COSL
	HARPT	100	9.25	COSL

Note: 1- See Appendix A.

Table 2 contains important soil characteristics for each of the fields identified in this plan. Each soil characteristic listed is representative for the entire field based on a weighted average. *(Caution: USDA NRCS Soil Survey information was used to estimate the values reported in Table 2. **These are not absolute values** and may vary for each specific situation. They are estimated values representative for each field.)* The following includes a brief description of each of those factors:

Dominant Surface Texture -- The predominant texture of the surface layer. Soil texture is the relative proportion, by weight, of the particle separate classes (sand, silt, and clay) finer than 2 mm in equivalent diameter. Soil texture influences engineering works and plant growth and is used as an indicator of how soils formed. (See Appendix A)

Available Water Capacity (AWC) -- The volume of water that should be available to plants if the soil, inclusive of fragments, were at field capacity. It is commonly defined as the difference between the amount of soil moisture at field capacity and the amount at permanent wilting point. Typical Available Water Capacities are 0.6 inches/foot for a Sand and 2.0 inches/foot for a Silt Loam. Available Water Capacity is an important soil property in developing water budgets, predicting droughtiness, designing and operating irrigation systems, designing drainage systems, protecting water resources, and predicting yields.

Surface Soil Erodibility Factor (K) -- A factor which quantifies the susceptibility of soil detachment by water. Factors vary from a low of 0.02 to a high of 0.64.

Soil Loss Tolerance (T) -- The maximum amount of erosion at which the quality of a soil as a medium for plant growth can be maintained.

Slope -- The difference in elevation between two points expressed as a percentage of the distance between those points.

Permeability -- The quality of the soil that enables water or air to move through it.

Permeability Class -- Permeability expressed by classes ranging from very rapid to impermeable. (See Appendix A)

Runoff Class - An index of the likelihood for runoff to occur based on inherent soil and slope characteristic. Runoff classes range from Negligible to Very High. (See Appendix A)

Surface pH -- A numerical expression of the relative acidity or alkalinity of the surface soil layer.

Surface pH Classification -- A general descriptive term for soil pH, acid or alkaline.

Table 3 contains additional important soil characteristics for each of the fields identified in this plan. Each soil characteristic listed represents a potential limiting condition within the soil profile (< 5 feet) across the field. ***(Caution:*** *USDA NRCS Soil Survey information was used to estimate the values reported in Table 2.* ***These are not absolute values*** *and may vary for each specific situation. They are estimated values representative for each field.)* The following includes a brief description of each of those factors:

Soil Layer with > 50 % Gravel, Cobble or Stone -- A layer comprised of more than 50 % gravel, cobbles or stones.

Pan - A compact, dense layer in the soil that impedes the movement of water and the growth of roots. Examples include: *hardpan, claypan, plowpan*, and *fragipan*. (See Appendix A)

Rock -- A layer of rock in the soil that impedes the movement of water and the growth of roots.

Seasonal High Water Table -- A seasonal water table that exist near the surface.

Drainage Class - Drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods. Alteration of the water regime by humans, either through drainage or irrigation, is not a consideration unless the alterations have significantly changed the morphology of the soil. (See Appendix A)

Hydrologic Group -- A group of soils having similar runoff potential under similar storm and cover conditions.

Table 2. Soil characteristics representative for each field

Field Name	Representative For Entire Field (Weighted Average)											
	Dominant Surface Texture & (Acreage)[1]	Total Available Water Capacity to 5 feet (in)	Surface Soil Erodibility Factor - K	Soil Loss Tolerance - T (tons/acre)	Calculated Sheet and Rill Erosion Rate[1] (tons/acre)	Calculated Irrigation Induced Erosion Rate[1] (tons/acre)	Slope (%)	Permeability (in/hour)	Permeability Class[1,2]	Runoff Class[1,3]	Surface pH	Surface pH Classification
1 / Owl	COSL(11.59)	10.01	0.24	5	-1	0	8.47	1.27	Moderate	M	6.74	Acid
2 / Rabbit	COSL(9.45)	9.61	0.24	5	-1	-1	9.31	1.6	Moderate	M	6.76	Acid
3 / Cottonwood	COSL(20.54)	10.14	0.26	5	-1	-1	4.49	1.27	Moderate	L	6.74	Acid
5 / Pheasant	L(82.98)	10.53	0.32	5	-1	-1	2	1.27	Moderate	L	6.74	Acid
6 / Skunk	SIL(129.18)	8.96	0.4	4	-1	-1	7.96	1.07	Moderate	M	7.26	Alkaline
7 / Snake	L(27.1)	7.9	0.43	4	-1	-1	17.3	0.32	Moderately Slow	M	7.12	Alkaline
8a / Upper Turkey	SIL(123.09)	9.29	0.43	4	-1	-1	3.65	0.74	Moderate	L	7.3	Alkaline
8b / Lower Turkey	SIL(13.31)	9.16	0.42	4	-1	-1	4.98	0.77	Moderate	L	7.29	Alkaline
9 / Bull	COSL(9.21)	9.97	0.24	5	-1	-1	5.67	1.32	Moderate	M	6.74	Acid

NOTES:

1 - See Appendix A.

2 - PERMEABILITY CLASSES: VR = Very Rapid, R = Rapid, MR = Moderately Rapid, M = Moderate, MS = Moderately Slow, S = Slow, VS = Very Slow, I = Impermeable.

3 - RUNOFF CLASS: N = Negligible, LV = Very Low, L = Low, M = Medium, H = High, HV = Very High.

Table 3. Soil characteristics that represent a potential limiting condition within the soil profile (< 5 feet) across the entire field.

Field Name	Depth to Limiting Layer < 5 feet - Soil Layer with > 50 % Gravel, Cobble or Stone					Depth to Limiting Layer < 5 feet - Pan[1]				
	Dominant Condition		Most Limiting Condition			Dominant Condition		Most Limiting Condition		
	Layer Description[1,2]	Acres	Layer Description[1,2]	Acres	Minimum Depth (in)	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)
1 / Owl	None Present	11.67		11.67	0	Pan Present	11.67	Pan Present	11.67	0
2 / Rabbit	None Present	11.23	GRV	0.01	48	Pan Present	11.23	Pan Present	0.01	20
3 / Cottonwood	None Present	26.3		26.3	0	Pan Present	26.3	Pan Present	26.3	0
5 / Pheasant	None Present	82.98		82.98	0	No Pan Present	82.98	No Pan Present	82.98	0
6 / Skunk	None Present	91.7	GRV	51.67	48	No Pan Present	91.7	Pan Present	51.67	20
7 / Snake	None Present	33.94	GRV	4.55	47	Pan Present	33.94	Pan Present	8.79	20
8a / Upper Turkey	None Present	73.86	GRV	49.24	48	No Pan Present	73.86	Pan Present	49.24	20
8b / Lower Turkey	None Present	8.98	GRV	0.05	47	Pan Present	8.98	Pan Present	5.35	20
9 / Bull	None Present	9.21		9.21	0	Pan Present	9.21	Pan Present	9.21	0

Field Name	Depth to Limiting Layer < 5 feet - Rock					Depth to Limiting Layer < 5 feet - Seasonal High Water Table				
	Dominant Condition		Most Limiting Condition			Dominant Condition		Most Limiting Condition		
	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)	Layer Description	Acres	Layer Description	Acres	Minimum Depth (in)
1 / Owl	No Rock Layer Present	11.67	No Rock Layer Present	11.67	N/A	Water Table Present	11.67	Water Table Present	11.67	6
2 / Rabbit	No Rock Layer Present	11.24	No Rock Layer Present	11.24	N/A	Water Table Present	11.24	Water Table Present	11.24	6
3 / Cottonwood	No Rock Layer Present	26.3	No Rock Layer Present	26.3	N/A	Water Table Present	26.3	Water Table Present	26.3	6
5 / Pheasant	No Rock Layer Present	82.98	No Rock Layer Present	82.98	N/A	No Water Table Present	82.98	No Water Table Present	82.98	6
6 / Skunk	No Rock Layer Present	143.37	No Rock Layer Present	143.37	N/A	No Water Table Present	143.37	No Water Table Present	143.37	6
7 / Snake	No Rock Layer Present	42.73	No Rock Layer Present	42.73	N/A	Water Table Present	42.73	Water Table Present	42.73	6
8a / Upper Turkey	No Rock Layer Present	123.09	No Rock Layer Present	123.09	N/A	No Water Table Present	123.09	No Water Table Present	123.09	6
8b / Lower Turkey	No Rock Layer Present	14.34	No Rock Layer Present	14.34	N/A	Water Table Present	13.44	Water Table Present	0.9	2
9 / Bull	No Rock Layer Present	9.21	No Rock Layer Present	9.21	N/A	Water Table Present	9.21	Water Table Present	9.21	6

Field Name	Drainage Class[1,3]		Hydrologic Group[1]	
	Dominant Drainage Class	Acres	Dominant Hydrologic Group	Acres
1 / Owl	Well drained	11.67	B	11.59
2 / Rabbit	Well drained	11.24	B	11.24
3 / Cottonwood	Well drained	26.3	B	26.28
5 / Pheasant	Well drained	82.98	B	82.98
6 / Skunk	Well drained	143.37	B	143.37
7 / Snake	Well drained	42.73	C	31.66
8a / Upper Turkey	Well drained	123.09	B	123.09
8b / Lower Turkey	Well drained	13.44	B	13.26
9 / Bull	Well drained	9.21	B	9.21

NOTES:

1 - See Appendix A.

2 - GRAVEL, COBBLE, or STONE: GRV = Very Gravelly, GRX = Extremely Gravelly, CBV = Very Cobbly, CBX = Extremely Cobbly, STV = Very Stony, STX = Extremely Stony, WB = Weathered Bedrock, and UWB = Unweathered Bedrock.

3 - DRAINAGE CLASS: E = Excessively drained, SE = Somewhat Excessively drained, W = Well drained, MW = Moderately Well drained, SP = Somewhat Poorly drained, P = Poorly drained, VP = Very Poorly drained.

ANALYSIS OF SOIL CHARACTERISTICS Legend

Soil Pan

Hardpan – A hardened or cemented layer soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Claypan – A slowly permeable soil horizon that contains much more clay than the horizon above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Plowpan – A compacted layer formed in the soil directly below the plow layer.

Fragipan – A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restrict roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than deform slowly.

Soil Drainage Class

Excessively drained (E). Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse-textured and have very high hydraulic conductivity or are very shallow. They are not suited to crop production unless irrigated.

Somewhat excessively drained (SE). Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep. The soils are commonly coarse-textured and have high saturated hydraulic conductivity or are very shallow. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained (W). Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons.

Moderately well drained (MW). Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a moderately low or lower saturated hydraulic conductivity in a layer within the upper 1 m, periodically receive high rainfall, or both.

Somewhat poorly drained (SP). Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.

Poorly drained (P). Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

Very poorly drained (VP). Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

Soil Hydrologic Group

Group A – Soils that have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands and gravels. These soils have a high rate of water transmission (greater than 0.30 in/hr).

Group B – Soils that have moderate infiltration rates when thoroughly wetted. They consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (greater than 0.15 – 0.30 in/hr).

Group C – Soils that have low infiltration rates when thoroughly wetted. They consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (greater than 0.05 - 0.15 in/hr).

Group D – Soils that have high runoff potential. They have very low infiltration rates when thoroughly wetted. They consist chiefly of clay soils with high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over impervious material. These soils have a very low rate of water transmission (greater than 0.0 - 0.05 in/hr).

Soil Permeability Class

Very Rapid:	20.0 to 100.0 inches/hour
Rapid:	6.0 to 20.0 inches/hour
Moderately Rapid:	2.0 to 6.0 inches/hour
Moderate:	0.6 to 2.0 inches/hour
Moderately Slow:	0.2 to 0.6 inches/hour
Slow:	0.06 to 0.20 inches
Very Slow:	0.0015 to 0.06 inches/hour
Impermeable:	0.0000 to 0.0015 inches/hour

Soil Texture Modifiers, Texture Class and Terms Used in Lieu of Texture.

Texture Modifiers

ASHY	Ashy
BY	Bouldery
BYV	Very bouldery
BYX	Extremely bouldery
CB	Cobbly
CBV	Very cobbly
CBX	Extremely cobbly
CN	Channery
CNV	Very channery
CNX	Extremely channery
COP	Coprogenous
DIA	Diatomaceous
FL	Flaggy
FLV	Very flaggy
FLX	Extremely flaggy
GR	Gravelly
GRC	Coarse gravelly
GRF	Fine gravelly
GRM	Medium gravelly
GRV	Very gravelly
GRX	Extremely gravelly
GS	Grassy
GYP	Gypsiferous
HB	Herbaceous
HYDR	Hydrous
MEDL	Medial
MK	Mucky
MR	Marly
MS	Mossy
PBY	Parabouldery
PBYV	Very Parabouldery
PBYX	Extremely Parabouldery
PCB	Paracobbly
PCBV	Very Paracobbly
PCBX	Extremely Paracobbly

Texture Class

C	Clay
CL	Clay loam
COS	Coarse sand
COSL	Coarse sandy loam
FS	Fine sand
FSL	Fine sandy loam
L	Loam
LCOS	Loamy coarse sand
LFS	Loamy fine sand
LS	Loamy sand
LVFS	Loamy very fine sand
S	Sand
SC	Sandy clay
SCL	Sandy clay loam
SI	Silt
SIC	Silty clay
SICL	Silty clay loam
SIL	Silt loam
SL	Sandy loam
VFS	Very fine sand
VFSL	Very fine sandy loam

Terms used in lieu of texture

BR	Bedrock
BY	Boulders
CB	Cobbles
CN	Channers
DUR	Duripan
FL	Flagstones
G	Gravel
HPM	Highly Decomposed plant material
MAT	Material
MPM	Moderately Decomposed plant material
MPT	Mucky peat
MUCK	Muck
OR	Ortstein
PBY	Paraboulders
PC	Petrocalcic
PCB	Paracobbles
PCN	Parachanners
PEAT	Peat
PF	Petroferric
PFL	Paraflagstones
PG	Paragravel
PGP	Petrogypsic
PL	Placic
PST	Parastones
SPM	Slightly Decomposed plant material
ST	Stones
W	Water

PCN	Parachannery
PCNV	Very Parachannery
PCNX	Extremely Parachannery
PF	Permanently frozen
PFL	Paraflaggy
PFLV	Very Paraflaggy
PFLX	Extremely Paraflaggy
PGR	Paragravelly
PGRV	Very Paragravelly
PGRX	Extremely Paragravelly
PST	Parastony
PSTV	Very Parastony
PSTX	Extremely Parastony
PT	Peaty
ST	Stony
STV	Very stony
STX	Extremely stony
WD	Woody

Appendix B: NUTRIENT RISK ANALYSIS

Phosphorus Runoff Risk Assessment

FIELD: 1 / Owl

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 2 / Rabbit

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 93.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: Incorporated < 3 inches (Harrowing/etc)

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High

Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 3 / Cottonwood
Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.
Soil Test P **Risk Rating:** Critical
Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data
Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data
Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen
Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible

with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High

Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 5 / Pheasant
Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data
Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data
Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen
Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** High
Manure Application Method: Incorporated >3 inches (Disking/Chiseling)
Comments: For greatest phosphorus efficiency inject Organic P > 2" or plow; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 6 / Skunk

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 93.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** High
Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject Organic P > 2" or plow; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 7 / Snake
Overall Risk Rating: High
High potential for P loss and adverse effects on surface and/or ground waters. Soil and water conservation measures and phosphorus management plans are needed to reduce the probability of phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the Idaho OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.
Soil Test P **Risk Rating:** Very High
Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data
Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data
Idaho Nutr. Management Standard Threshold: 20 **Soil Test Type:** Olsen
Comments: Soil test P is very high and may be approaching the critical Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High
Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated
Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 69.8
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: N/A
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.
Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** Very Low or N.A.
List best management practices that mitigate runoff(See Appendix B)
Comments: No Data

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 8a / Upper Turkey

Overall Risk Rating: Very High
Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 52.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.

Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.

Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 8b / Lower Turkey

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.

Phosphorus Application Rate: 0

Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** High

Phosphorus Application Method: Incorporated <3 inches (Harrowing/etc) or Irrigated

Comments: For greatest phosphorus efficiency place commercial fertilizer P with planter or inject > 2"; otherwise incorporate > 3" by disking, chiseling, etc. Where phosphorus is applied with irrigation, time applications to coincide as closely as possible with plant uptake. Emergency applications outside the growing season must be based on a water balance.

Manure Phosphorus Application Rate **Risk Rating:** Medium

Manure Application Rate: 52.4

Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium

Manure Application Method: N/A

Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very Low or N.A.

Comments: No Data

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.

Comments: No Data

Runoff Best Management Practices **Risk Rating:** High

List best management practices that mitigate runoff(See Appendix B)

Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High

Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

FIELD: 9 / Bull

Overall Risk Rating: Very High

Very high potential for phosphorus loss and adverse effects on surface and/or ground waters. All necessary soil and water conservation measures and a phosphorus management plan must be implemented to minimize phosphorus loss. Reference risk assessment below and consult a local resource conservation planning specialist and/or the OnePlan Conservation Planning module to determine appropriate Best Management Practices for this field.

Soil Test P **Risk Rating:** Critical

Soil Test Depth / Phosphorus Concentration 0-12": No Valid Soil Test Data

Soil Test Depth / Phosphorus Concentration 18-24": No Valid Soil Test Data

Idaho Nutr. Management Standard Threshold: 40 **Soil Test Type:** Olsen

Comments: Soil test P is above the Idaho Nutrient Management Standard Phosphorus Threshold. Test soils annually to monitor buildup or decline in soil P and to determine if your Nutrient Management Plan is successful in reducing soil P levels.

Phosphorus Fertilizer Application Rate **Risk Rating:** Very Low or N.A.
Phosphorus Application Rate: 0
Comments: No Data

Phosphorus Fertilizer Application Method **Risk Rating:** Very Low or N.A.
Phosphorus Application Method: Not Applied
Comments: No Data

Manure Phosphorus Application Rate **Risk Rating:** Medium
Manure Application Rate: 93.4
Comments: Sufficient soil P may be available for normal agronomic production after fertilization, except for possible response to a starter fertilizer for specific crops like potatoes (see Crop Specific Recommendations). A long range nutrient management plan will assist you in maintaining optimum P levels.

Manure Phosphorus Application Method **Risk Rating:** Medium
Manure Application Method: Incorporated < 3 inches (Harrowing/etc)
Comments: For greatest phosphorus efficiency inject organic P > 2" or plow.

Irrigation Runoff Index (Irrigated) **Risk Rating:** Very High
Comments: Reduce surface irrigation flows and/or field slope; or capture tail-water and use a pumpback to reapply tail-water; or if possible and appropriate convert to sprinkler irrigation.

Surface Irrigation or Overhead Irrigation **Risk Rating:** Very Low or N.A.
Comments: No Data

Runoff Best Management Practices **Risk Rating:** High
List best management practices that mitigate runoff(See Appendix B)
Comments: Consider implementing Conservation Practices on-field and off-field that reduce or eliminate runoff and erosion.

Distance to Surface Water Body: 0 **Risk Rating:** Very High
Comments: Because of the high soil test P, runoff should be eliminated by converting to sprinkler irrigation or installing a tailwater recovery system; or sediment retention measures like filter strips or sediment basins should be installed to minimize offsite transport and loss of Phosphorus.

Nutrient Leaching Risk Assessment

FIELD: 1 / Owl

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 2 / Rabbit

Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Low

Deep Percolation (as % of Evapotranspiration): 11-20% Over ET

Comments: Nutrient leaching should not be a problem. Apply water according to crop requirements. Monitor soil Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) for salt accumulation. Do not apply nitrogen prior to leaching events.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 3 / Cottonwood
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied).

Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 5 / Pheasant

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Low

Deep Percolation (as % of Evapotranspiration): 11-20% Over ET

Comments: Nutrient leaching should not be a problem. Apply water according to crop requirements. Monitor soil Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) for salt accumulation. Do not apply nitrogen prior to leaching events.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 6 / Skunk

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 7 / Snake

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Low

Comments: Because the dominant soils have slow infiltration rates and water transmission, this field will probably not contribute to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water should be minimal.

FIELD: 8a / Upper Turkey

Overall Risk Rating: Medium

Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium

Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 8b / Lower Turkey
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.
Deep Percolation (as % of Evapotranspiration): <5% Over ET
Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.
Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Medium
Comments: Use a nitrogen inhibitor to delay nitrification of ammonia-N until plant growth increases and additional nitrogen is needed.

Irrigation Efficiency **Risk Rating:** Very High
Comments: Check and maintain system for leaky joints and worn-out pumps, sprinklers or nozzels. Use flow controllers to improve efficiency. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirements are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium
Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

FIELD: 9 / Bull
Overall Risk Rating: Medium
Leaching losses may be contributing to soluble nutrient leaching below the root zone during some years.

Percolation **Risk Rating:** Very Low or N.A.

Deep Percolation (as % of Evapotranspiration): <5% Over ET

Comments: Nutrient leaching should not be a problem, however, there is a potential salt balance problem (and the crop's water requirement may not be completely satisfied). Evaluate whether adequate water is being applied to meet salt (leaching) requirements. If irrigation water has a high Electrical Conductivity (EC)/Sodium Adsorption Ration (SAR) salt balance may be critical.

Nitrogen Application Rate **Risk Rating:** Very Low or N.A.

Comments: Some potential for nitrogen leaching if excess water is applied from irrigation and/or precipitation events. Potential for yield reduction from a nitrogen deficiency. Use soil and/or plant test and appropriate fertilizer recommendation for determining nutrient application rates.

Nitrogen Application Timing **Risk Rating:** Very Low or N.A.

Comments: Good job! Follow Nitrogen application recommendations and apply according to crop growth needs.

Irrigation Efficiency **Risk Rating:** Very High

Comments: Due to the low irrigation efficiency on this field, conversion to a more efficient irrigation system like Sprinkler or Drip Irrigation should be considered. If this is not possible consider shorter set times to minimize runoff and/or the length of run to minimize leaching. A Tailwater Recovery & Pumpback System will help to reduce or eliminate runoff. An additional consideration is to incorporate a Surge Irrigation that will help to reduce runoff and deep percolation losses. Be sure that the right amount of irrigation water is applied as uniformily as possible to meet crop needs and minimize leaching from the root zone. Check with irrigation professional to assure that crop growth requirments are being adequately met.

Soil/Water Table Depth **Risk Rating:** Medium

Comments: Because the dominant soils have moderate to high infiltration rates and water transmission, this field may be vulnerable to ground water contamination. Nutrient leaching and subsequent subsurface transport to ground water and interconnected surface water may be a concern.

NUTRIENT RISK ANALYSIS Legend

BMP	Definition	Purpose
Buffer Strip	Contour buffer strips are strips of perennial grass alternated with wider cultivated strips that are farmed on the contour.	Contour buffer strips slow runoff water and trap sediment. Consequently, soil erosion is generally reduced significantly by this practice. Sediments, nutrients, pesticides, and other potential pollutants are filtered out as water flows through the grass strips. The grass strips also provide food and cover for wildlife.
Channel Vegetation	Establishing and maintaining adequate plants on channel banks, berms, spoil, and associated areas.	To stabilize channel banks and adjacent areas and reduce erosion and sedimentation. To maintain or enhance the quality of the environment, including visual aspects and fish and wildlife habitat.
Chiseling and Subsoiling	Loosening the soil, without inverting and with a minimum of mixing of the surface soil, to shatter restrictive layers below normal plow depth that inhibit water movement or root development.	To improve water and root penetration and aeration.
Composting Facility	A composting facility is	The purpose of this

	installed for biological stabilization of waste organic material.	practice is to biologically treat waste organic material and produce humus-like material that can be recycled as a soil amendment or organic fertilizer. The material may also be used by other acceptable methods of recycling that comply with laws, rules and regulations.
Conservation Cover	This practice involves establishing and maintaining a protective cover of perennial vegetation on land retired from agriculture production.	This practice reduces soil erosion, associated sedimentation, improves water quality, and creates or enhances wildlife habitat.
Conservation Cropping Sequence	Growing crops in a recurring sequence on the same field.	This practice may be applied as part of a best management practice to support one or more of the following: Reduce sheet and rill erosion, Reduce irrigation induced erosion, Reduce soil erosion from wind, Maintain or improve soil organic matter content, Manage deficient or excess plant nutrients, Improve water use efficiency, Manage saline seeps, Manage plant pests (weeds, insects, diseases), Provide food for domestic livestock, and Provide food and cover for wildlife.
Contour Farming	Farming sloping land in	To reduce erosion and

	such a way that preparing land, planting, and cultivating are done on the contours. (This includes following established grades of terraces or diversion.)	control water.
Cover and Green Manure Crop	A crop of close-growing, legumes, or small grain grown primarily for seasonal protection and soil improvement. It usually is grown for 1 year or less, except where there is permanent cover as in orchards.	To control erosion during periods when the major crops do not furnish adequate cover; add organic material to the soil; and improve infiltration, aeration, and tilth.
Critical Area Planting	Planting vegetation on critically eroding areas that require extraordinary treatment.	This practice is used on highly erodible areas that cannot be stabilized by ordinary planting techniques and if left untreated may cause severe erosion or sediment damage. Examples of critical areas include the following: 1) Dams, dikes, levees, and other construction sites with very steep slopes, 2) Mine spoil and surface mined land with poor quality soil and possibly chemical problems, and 3) Agriculture land with severe gullies requiring specialized planting techniques and management.
Dike or Berm	An embankment constructed of earth or other suitable materials	Dikes are used to: Permit improvement of agricultural land by

	to protect land against overflow or to regulate water.	preventing overflow and better use of drainage facilities, Prevent damage to land and property, Facilitate water storage and control in connection with wildlife and other developments, and Protect natural areas, scenic features and archeological sites from damage.
Diversion	A channel constructed across the slope with a supporting ridge on the lower side.	To divert excess water from one area for use or safe disposal in other areas.
Drip Irrigation	A planned irrigation system in which all necessary facilities are installed for efficiently applying water directly to the root zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe) operated under low pressure. The applicators can be placed on or below the surface of the ground.	To efficiently apply water directly to the plant root zone to maintain soil moisture within the range for good plant growth and without excessive water loss, erosion, reduction in water quality, or salt accumulation.
Filter Strip	A strip or area of vegetation for removing pollutants water.	A filter strip reduces pollution by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization of sediment, organic matter, and other pollutants from runoff and waste water.
Fish Stream Improvement	Fish Stream Improvement is	The purpose of the practice is to increase

	improving a stream channel to make or enhance fish habitat.	production of desired species of fish. The practice involves improving food supplies, shelter, spawning areas, water quality, and other elements of fish habitat.
Grade Stabilization Construction	A structure used to control the grade and head cutting in natural or artificial channels.	These structures are to: Stabilize the grade and control erosion in natural or artificial channels, prevent the formation or advance of gullies, enhance environmental quality, and reduce pollution hazards.
Grassed Waterway	A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff.	Grassed waterways convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and to improve water quality.
Grazing Land Mechanical Treatment	Modifying physical soil and/or plant conditions with mechanical tools by treatments such as; pitting, contour furrowing, and ripping or sub-soiling.	This practice should be applied as part of a best management practice to support one or more of the following purposes: Fracture compacted soil layers and improve soil permeability, Reduce water runoff and increase infiltration, Break up sod bound conditions and thatch to increase plant vigor, and Renovate and stimulate plant community for greater productivity and yield.

Heavy Use Area Protection	Protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.	To stabilize urban, recreation, or facility areas frequently and intensely used by people, animals, or vehicles.
Irrigation Land Leveling	Reshaping the surface of land to be irrigated to planned grades.	To permit uniform and efficient application of irrigation water without causing erosion, loss of water quality, or damage to land by waterlogging and at the same time to provide for adequate surface drainage.
Irrigation Water Management	Irrigation water management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner.	Irrigation water management is applied as part of a conservation management system to support one or more of the following: Manage soil Moisture to promote desired crop response; Optimize use of available water supplies; Minimize irrigation induced soil erosion; Decrease non-point source pollution of surface and groundwater resources; Manage salts in the crop root zone; Manage air, soil, or plant micro-climate.
Mulching	Applying plant residues or other suitable materials not produced on the site to the soil surface.	To conserve moisture; prevent surface compaction or crusting; reduce runoff and erosion; control weeds; and help establish plant cover.

Polyacrylamide (PAM)	Polyacrylamide is an organic polymer formulated to stabilize soil when applied in irrigation water.	Water applied with PAM stabilizes soil aggregates which can then resist the erosive forces of water. If correctly applied, PAM will produce clear runoff water and reduce erosion within the field by over 90 percent.
Prescribed Grazing	Prescribed grazing is the controlled harvest of vegetation with grazing animals, managed with the intent to achieve a specific objective.	Application of this practice will manipulate the intensity, frequency, duration, and season of grazing to: 1) Improve water infiltration, 2) maintain or improve riparian and upland area vegetation, 3) protect stream banks from erosion, 4) manage for deposition of fecal material away from water bodies, and 5) promote ecological and economically stable plant communities which meet landowner objectives.
Residue Management (Conservation Tillage)	Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface.	This practice may be applied as part of a conservation system to support one or more of the following: Reduce sheet and rill erosion. Reduce wind erosion. Maintain or improve soil organic matter content and tilth. Conserve soil moisture. Manage snow to increase plant available moisture. Provide food and escape cover for wildlife.

Riparian Forest Buffer	A riparian forest buffer is an area of trees and/or shrubs located adjacent to a body of water. The vegetation extends outward from the water body for a specified distance necessary to provide a minimum level of protection and/or enhancement.	The riparian forest buffer is a multi-purpose practice design to accomplish one or more of the following: Create shade to lower water temperatures and improve habitat for aquatic animals, Provide a source of debris necessary for healthy robust populations of aquatic organisms and wildlife, and Act as a buffer to filter out sediment, organic material, fertilizer, pesticides and other pollutants that may adversely impact the water body, including shallow ground water.
Sediment Basin	A basin constructed to collect and store debris or sediment.	A sediment basin may have the following uses: Preserve the capacity of reservoirs, ditches, canals, diversion, waterways, and streams, Prevent undesirable deposition on bottom lands and developed areas, Trap sediment originating from construction sites, and Reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.
Sprinkler System	A planned irrigation	To efficiently and

	system in which all necessary facilities are installed for efficiently applying water by means of perforated pipes or nozzles operated under pressure.	uniformly apply irrigation water to maintain adequate soil moisture for optimum plant growth without causing excessive water loss, erosion, or reduced water quality.
Stream Channel Stabilization	Stabilizing the channel of a stream with suitable structures.	To control aggradation or degradation in a stream channel.
Streambank Protection	Using vegetation or structures to stabilize and protect banks of streams, lakes, estuaries, or excavated channels against scour and erosion.	To stabilize or protect banks of streams, lakes, estuaries, or excavated channels for one or more of the following purposes: Prevent the loss of land or damage to utilities, roads, buildings, or other facilities adjacent to the banks, Maintain the capacity of the channel, Control channel meander that would adversely affect downstream facilities, Reduce sediment loads causing downstream damages and pollution, and Improve the stream for recreation or as a habitat for fish and wildlife.
Stripcropping, Contour	Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a	To reduce sheet and rill erosion and/or to reduce transport of sediment and other water-borne contaminants.

	strip of clean-tilled crop or fallow or a strip of grass is alternated with a close-growing crop.	
Stripcropping, Field	Growing crops in a systematic arrangement of strips or bands across the general slope (not on the contour) to reduce water erosion. The crops are arranged so that a strip of grass or a close-growing crop is alternated with a clean-tilled crop or fallow.	To help control erosion and runoff on sloping cropland where contour stripcropping is not practical.
Subsurface Drains	A Subsurface Drain is a conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	The purpose of a subsurface drain is to: Improve the environment for vegetation, Reduce erosion, Improve water quality, Collect ground water for beneficial use, Remove water from heavy use areas such as recreation areas, or around buildings, and Regulate water to control health hazards caused by pests.
Surge Irrigation	Surge irrigation is the intermittent application of water to furrows, corrugates, or borders creating a series of on and off periods of constant or variable time spans.	Surge allows a lighter application of water with a higher efficiency. The result is less deep percolation of water at the upper end of the field and a more uniform application.
Tailwater Recovery & Pumpback System	A facility to collect, store, and transport	To conserve farm irrigation water supplies

	irrigation tailwater for reuse in a farm irrigation distribution system.	and water quality by collecting the water that runs off the field surface for reuse on the farm.
Terraces	An earth embankment, a channel, or a combination ridge and channel constructed across the slope.	Reduce slope length, reduce sediment content in runoff water, reduce erosion, Improve water quality, intercept and conduct surface runoff at a non-erosive velocity to a stable outlet, retain runoff for moisture conservation, prevent gully development, reform the land surface, improve farmability, and reduce flooding.
Use Exclusion	Excluding animals, people or vehicles from an area.	To protect, maintain, or improve the quantity and quality of the plant, animal, soil, air, water, and aesthetics resources and human health and safety.
Water and Sediment Control Basin	An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.	To improve farmability of sloping land, reduce watercourse and gully erosion, trap sediment, reduce and manage onsite and downstream runoff, and improve downstream water quality.
Watering Facility	A device (tank, trough, or other watertight container) for providing animal access to water.	To provide watering facilities for livestock and/or wildlife at selected locations in order to: 1) protect and enhance vegetative cover through

		proper distribution of grazing; 2) provide erosion control through better grassland management; or 3) protect streams, ponds and water supplies from contamination by providing alternative access to water.
Wetland Development/Restoration	The construction or restoration of a wetland facility to provide the hydrological and biological benefits of a wetland.	To develop or restore hydric soil conditions, hydrologic conditions, hydrophytic plant communities, and wetland functions.

Appendix C: CROP SPECIFIC GUIDELINES

Alfalfa, Hay, Cut Mature, S-ID, Irrigated
UNIVERSITY OF IDAHO INFORMATION

SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.
GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.
THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO3-N) and (NH4-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

Nutrient requirements for alfalfa are relatively high compared to many other crops commonly grown in Idaho. Each ton of alfalfa hay removes about 60 lb nitrogen (N) per acre, 50 lb potassium (K) per acre, 30 lb calcium (Ca) per acre, 8 lb phosphorus (P) per acre, and about 6 lb per acre of both sulfur (S) and magnesium (Mg). Requirements for phosphorus and potassium fertilizers are much higher than for S, manganese (Mn), zinc (Zn), iron (Fe), and boron (B).

NITROGEN (N)

Essentially all nitrogen required by established alfalfa is provided by the symbiotic relationship with N-fixing Rhizobium bacteria and N mineralized from soil organic matter. Top dressed N usually does not improve yield, quality, or vigor of established stands. However, applications of 20 to 40 lb N per acre may be helpful during stand establishment prior to nodulation of the roots. Applied N would most likely be needed following small grain production in which the residue is returned to the soil. Application of larger amounts may inhibit nodulation, decrease symbiotic N fixation, and encourage grass weeds, thereby reducing alfalfa growth or quality when harvested. Alfalfa receiving appreciable amounts of animal manures, dairy effluent, or other organic N sources will also have reduced N fixation. The probability of an N response is usually greatest on coarse-textured soils with low organic matter content. Nitrogen fertilizer may be required for maximum alfalfa production and quality if the roots are poorly nodulated. Poor nodulation as well as poor Rhizobial activity and N-fixing capacity can result from a number of factors, including lack of proper seed inoculation at planting, diseases, insects, water deficits, nutrient deficiencies or toxicities, or other soil physical or chemical conditions that reduce the effectiveness of the Rhizobium inoculant. Poor inoculation results from not using inoculant, using inoculant that has lost its viability (expired shelf life), or using Rhizobium inoculant strains that are not effective. Poor inoculation, nodulation, or Rhizobial effectiveness is indicated when alfalfa protein is low (less than 18%) when cut at the early bloom stage. Healthy Rhizobium nodules should be pink when cut open if they are effectively fixing atmospheric N. If nodulation or Rhizobial effectiveness is limited by pests, water deficits, or soil conditions such as salinity, sodicity, nutrient deficiencies, or soil compaction, then attempts should be made to correct the problem through appropriate management practices. For more information on proper inoculation of alfalfa, refer to CIS 838, (Inoculation of Legumes in Idaho). Alfalfa is sometimes used to scavenge nutrients from soils receiving excessive animal manure or other biological waste applications. An alfalfa crop yielding 6 tons per acre can remove up to 360 lb of N per acre. However, excessive nitrogen uptake can increase the forage nitrate toxicity hazard for dairy and beef cattle. In addition, animal manure applications can promote grass and weed growth, which in turn can also increase the potential for nitrate toxicity if the population of the noxious weed Kochia increases.

Producers sometimes plant a companion crop when establishing alfalfa in order to increase the productivity of the first cutting. However, this practice is not recommended because the alfalfa stand typically is reduced by competition from the companion crop. If growers plant alfalfa with a companion crop, both crops compete for the available N. Under these conditions, N rates of 30 to 40 lb per acre are suggested if available soil N does not exceed 60 to 80 lb per acre.

PHOSPHORUS (P)

Adequate phosphorus availability is important for maintaining plant health, winter hardiness, and optimum root, stem, and leaf growth. Since phosphorus is relatively immobile in soil, P fertilizer should be incorporated into the soil prior to planting to raise soil P concentrations to optimum levels for early plant growth. The phosphorus recommendations presented are based on the soil test P concentration and free lime content in the top foot of soil, and the yield potential. Significant amounts of free lime in the soil will make less phosphorus available to plants as it precipitates soil solution P. Top dressed P applications can also be effective but should be made following harvest in the fall or in the spring before regrowth in order to maximize soil contact. Knifing ammonium polyphosphate (10-34-0) into the soil or applying surface bands in the fall or spring are also effective P fertilization methods for alfalfa. As the stand ages and plant density decreases, the ability of the alfalfa root system to take up P diminishes due to decreased soil P concentrations and root activity. Under these conditions, smaller P rates applied more frequently may increase P uptake efficiency. Effective sources of P for alfalfa include monoammonium phosphate (11-52-0), triple superphosphate (0-45-0), ammonium polyphosphate (10-34-0), and phosphoric acid. Fertilizer P can be broadcast as 11-52-0 or applied through the irrigation system as 10-34-0 with equal effectiveness. Phosphorus sources should be selected on the basis of cost, local availability, and equipment requirements.

POTASSIUM (K)

Alfalfa has a high potassium requirement. A crop of 8 tons per acre will remove about 480 lb of K2O per acre. Most Idaho soils and surface irrigation waters are naturally high in K. However, K deficiencies can develop in intensively cropped fields, particularly those fields cropped to alfalfa for many years. Sandy soils are generally more prone to developing K deficiencies than silt loam or clay soils and therefore have a higher probability of responding to K fertilization. Potassium movement in soils is limited, although it is more mobile than P. Like phosphorus, potassium fertilizer recommendations are based on calibrated relationships between soil test concentrations in the top foot of soil and yield response. Soil test K should generally be in the range of 160 to 200 ppm for optimum alfalfa yield. Potassium fertilizer should also be incorporated during seedbed preparation prior to establishment, or broadcast in the fall or early spring on established stands. Potassium chloride (0-0-60), potassium sulfate (0-0-52), K-Mag, and various liquid K fertilizers are all effective K sources for alfalfa. Potassium applications exceeding 300 lb K2O per acre should be split between fall and spring to avoid salt damage. Excessive K applications should be avoided since alfalfa will remove substantially more K than it needs for maximum yield. Excessive K concentrations in alfalfa can contribute to milk fever in dairy cattle.

SULFUR (S)

Sulfur is a key contributor to alfalfa yield and quality. Sulfur requirements for alfalfa vary with soil texture, leaching losses, soil test SO4-S concentration, and S content of the irrigation water. About 30 to 40 lb of SO4-S should be applied before planting to soils containing less than 10ppm SO4-S in the top foot of soil. This amount should provide adequate soil S for several years, provided the SO4-S is not leached from the rooting depth. The SO4-S form is mobile and can be leached to lower soil profile depths. For established alfalfa, sampling to a depth of two feet will provide a more accurate indication of S availability to alfalfa roots beyond the first foot. Areas irrigated with water from the Snake River or streams fed by return flow should have adequate S for alfalfa production. High rainfall areas, mountain valleys, and foothills are more likely to have S deficiencies, particularly on course-textured soils with low organic matter content. Sulfur fertilizer sources should be carefully selected because elemental S must be converted to SO4-S by soil microorganisms before plant roots can take it up. Conversion of elemental S to SO4-S may take several months in warm, moist soil. Consequently, elemental S fertilizers usually cannot supply adequate levels of S to alfalfa in the year that it is applied. However, elemental S fertilizers can supply considerable S during the year following application. Sulfate-sulfur sources such as gypsum (calcium sulfate), ammonium sulfate (21-0-0), or potassium sulfate (0-0-52-18) are recommended to correct S deficiencies during the year of application.

SECONDARY NUTRIENTS AND MICRONUTRIENTS

CALCIUM (Ca) and MAGNESIUM (Mg) deficiencies in alfalfa are rare in the irrigated areas of southern Idaho. Most soils in the Snake River plain have adequate amounts of Ca and Mg for alfalfa production, although low soil Mg concentrations are sometimes encountered on very sandy soils that have been heavily fertilized with K for long periods. Under these conditions, applications of MgSO4 or K-Mag at 20 to 40 lb of Mg per acre may provide a benefit. Micronutrient applications should be based on recent soil test results.

BORON (B) deficiencies can usually be corrected by applying 2 to 3 lb of B per acre for the duration of the crop. However, on very sandy soils, or high rainfall areas where soils are subject to excessive leaching of B, annual applications of 1/2 to 1 lb of B per acre may be more Sulfur effective. Commonly used forms of B include boric acid, Borax, and sodium borate.

ZINC (Zn), MANGANESE (Mn), and IRON (Fe) deficiencies can be corrected by applying 5 to 10 lb per acre of the required nutrient using Zn, Mn, or Fe sulfates or other soluble forms.

MOLYBDENUM (Mo) availability is generally adequate in the alkaline soils that are prevalent in the irrigated areas of southern Idaho.

TISSUE TESTING

Plant tissue testing provides an effective means of evaluating the nutrient status of an established alfalfa stand. Samples should be collected from about 20 to 30 plants at early bloom in representative areas of the field that are free from water stress or obvious pest problems. The top six inches of the stem should be sampled and sent immediately to a soil testing lab for analysis. Sufficiency ranges for the various nutrients are presented below. Nutrient concentrations below these ranges indicate a need for supplemental fertilization. When nutrient deficiencies are identified during the growing season, the deficiencies can often be corrected by injecting water-soluble fertilizers through the sprinkler system. Liquid forms of N, P, K, S, and micronutrients are commonly available in Idaho and should be selected on the basis of cost relative to dry fertilizers and ease of application. If alfalfa is furrow irrigated, foliar sprays can be used to correct micronutrient deficiencies but avoid foliar applications of N, P, K, and S at high rates that can cause foliar burning.

Contact your County Extension Agent if you have any questions regarding the interpretation of this information or for further information on your local needs.

Corn, Field, Silage, S-ID, Irrigated
UNIVERSITY OF IDAHO INFORMATION

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fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Nitrogen rates depend upon some of the following factors: previous crop, past fertilizer use, soil type and leaching hazard and realistic yield goal for the grower and the area. Adequate N is necessary for maximum economic production of irrigated field corn used for silage or grain. Fertilizer N represents by far the largest share of the fertilizer costs for field corn in Idaho. The amount of N required depends on many factors that influence total corn production and quality. These factors include length of growing season, corn hybrid, previous crop, past fertilizer use, soil type, leaching hazard and previous manuring. Estimates of both the N available to corn during the season and the yield potential of the crop should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical field corn yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a good field corn yield depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by corn for maximum yield.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate (N03-N) and ammonium (NH4-N), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (N03, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high as or higher than N03-N. NH4-N should be determined along with N03-N, especially when there is reason to expect the presence of appreciable NH4-N, such as recent ammonium N fertilizer applications. Soil samples should be collected before seeding in the spring to represent the area to be fertilized.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, "Wheat Straw Management and Nitrogen Fertilizer Requirements." Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of field corn. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which field corn is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciably depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to field corn. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side dressed.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required producing a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - (Irrigation Water)

TIMING OF NITROGEN APPLICATION - Coarse-textured soils, including sandy loams, loamy soils and sands, may lose N from leaching. For these soils, side dress a portion of the N at the time of the last cultivation. Sprinkler irrigation of corn under center pivots provides increased flexibility for providing N during the season. With sprinklers N can be injected into the system and applied with the water. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated. High N rates (approaching 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. High plant populations (above 28,000 to 30,000) and early plantings of longer season hybrids in the Treasure Valley will respond to high N rates provided there are no other limiting factors. High N rates will not compensate for reductions in stand or delayed plantings. High plant populations of field corn are more susceptible to N shortages because of greater competition among plants for limited N. Side dressing may cause root pruning depending on plant size, distance of shank from the row and placement depth. High N rates (above 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. On sandy textured soils subject to leaching, side dress a portion of the N at the time of the last cultivation. Under sprinkler irrigations, N can be injected through the lines throughout the season. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated.

PHOSPHORUS (P)

Adequate phosphorus is necessary for maximum production of field corn. The soil test for P is based on samples collected from the first foot of soil. The soil is extracted with sodium bicarbonate. Economic response to fertilizer P is more likely with cooler soil temperatures and soils with high lime content, particularly when planting long season hybrids. Phosphorus is an immobile nutrient that does not move appreciably from where it is placed. It should be mixed into the seedbed or banded within easy reach of the seedling roots before or during the planting operation.

POTASSIUM (K)
Field corn requires adequate potassium for optimum growth. Soil test K can be useful in determining the need for K fertilizers. The soil sample is taken from the first foot of soil and extracted with sodium bicarbonate. Fertilizer K rates are based on soil test.

SULFUR (S)
The major corn-growing regions in Idaho should not experience shortages of S. Areas with S deficiencies include some irrigated areas where both the soil and irrigation water are low in S. Snake River water is known to have high S concentrations. Coarse-textured soils including sandy loams, loamy sands and sands would be more susceptible to S deficiencies than silt loam soils. Where the need for S is evident, use 30 pounds per acre of sulfate-sulfur (S04).

MICRONUTRIENTS
1) Zinc (Zn) deficiencies occur primarily on soils that are eroded, leveled or where the exposed subsoil is higher in lime. The DTPA test on soil samples collected from the first foot can be used for identifying Zn fertilizer needs. Apply 10 pounds of Zn per acre when the soil test measures less than 0.6 ppm.

2) Other micronutrients have not been shown to limit corn production. "Shotgun" applications of micronutrient mixtures containing boron (B), copper (Cu), iron (Fe) and manganese (Mn) "for insurance" have not been shown to be economical and are not recommended.

SALINITY (SALTS)
Field corn has a low to moderate tolerance to accumulated salts. Soils with total salt readings above 3 or 4 mmhos/cm can be cropped effectively. Readings up to 6 are also satisfactory although more careful water management may be required.

Triticale Haylage, Winter, Double Cropped, S-ID, Irrigated
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SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking

the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.
GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.
THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO_3-N) and (NH_4-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Adequate nitrogen is necessary for maximum production of irrigated triticale. Nitrogen represents, by far, the largest share of fertilizer costs for triticale in Idaho. The amount of nitrogen required depends on many factors which influence total triticale production and quality. Both yield potential and available nitrogen ($N0_3 + NH_4$) should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical triticale yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a bushel of irrigated triticale depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by triticale for maximum yield. The results of irrigated field trials in the Boise and Magic valleys suggest as a rule that 2 pounds available N per bushel of triticale is required for maximum production up to 120 bushels per acre. Above 120 bushels per acre, the factor is somewhat less than two.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate (N03-N) and ammonium (NH4-N), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (N03, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high or higher than N03-N. NH4-N should be determined along with N03-N, especially when there is reason to expect the presence of appreciable NH4-N, such as recent ammonium N fertilizer applications. A preplant soil sample is often only collected from the first foot of soil. Although this information is not as complete and reliable as would be provided by deeper sampling, residual N measurements from the first foot of soil can be combined with estimates of residual N in the second foot to predict N requirements for irrigated winter triticale. For fall planted winter cereals in western Idaho, preplant soil test N03-N in the second foot of the soil is commonly only one-half to two-thirds as high as in the first foot of soil. However, this estimate may not be accurate after potatoes or other sprinkler irrigated crops, especially in coarser textured soils. Basing N rate recommendations on estimates of residual N in the second foot increases the risk of recommending either too little or too much N.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, "Wheat Straw Management and Nitrogen Fertilizer Requirements." Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of winter triticale. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which winter triticale is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciable depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to winter triticale. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side-dressed.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required to produce a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - Irrigation Water

TIMING OF NITROGEN APPLICATION - Excessive irrigation or heavy winter precipitation can result in leaching of nitrate N beyond the root systems. This hazard exists on all soils, but particularly on coarse textured soils such as sands, and sandy loams. Fall pre-plant N was once thought to be as good or preferable to spring top-dressed N in calcareous silt loam or clay soils in areas of low rainfall. However, even under these conditions, southern Idaho research has shown than N applied in late winter or early spring is frequently used more effectively than early fall preplant applied N. Nitrogen fertilizers containing ammonium (ammonium sulfate, anhydrous or aqua ammonia, or urea) are less subject to leaching losses when lower soil temperatures (less than 40 F) inhibit the microbial conversion of ammonium to nitrate. Lower temperatures also reduce the microbial activity that is responsible for the immobilization of applied N. Late fall, split, or spring applied N is also recommended when residues from previous grain or mature corn crops are returned to the soil in early fall. Early spring N applications are more effective for increasing grain protein for irrigated hard red winter triticale. Nitrogen applied after the boot stage will contribute more to grain protein than to yield. Most triticale varieties respond in a similar way to N. However, varieties differ in their tolerance of high N rates. High N contributes to lodging of varieties with poor straw strength.

PHOSPHORUS (P)
Triticale requires little phosphorus compared to the P requirements of other crops although minimum soil levels are necessary for maximum production. Adequate P is especially necessary for winter hardiness. Soil tests can indicate whether soils require phosphorus fertilization for maximum triticale production. Soil samples are taken from the 0- to 12-inch depth. Broadcast plowdown, broadcasts seedbed incorporation or drill banding low rates of P with seed are effective methods of application. Drill banding may reduce the fertilizer P required. Drill banding high rates of P, especially ammonium phosphate fertilizers, can cause seedling damage. For more detailed discussion of banding, refer to PNW 283, "Fertilizer Band Location for Cereal Root Access."

POTASSIUM (K)
Triticale has a lower requirement for K compared to sugarbeets, corn or potatoes. Soil tests can be useful indicators of the need for K. Potassium should be incorporated during seedbed preparation.

SULFUR (S)
Sulfur requirements for triticale will vary depending on soil texture, previously incorporated crop residues, leaching losses, S content of irrigation water and S soil test. Triticale irrigated with Snake River water should not experience S shortages. Soils low in S (less than 10 ppm S04-S in the plow layer or 8 ppm in the 0- to 12-inch depth) should receive 20 to 40 pounds of S per acre. Sulfur deficiency appears as a general yellowing of the plant early in the season and looks much like N deficiency. Plant analysis can be a useful means of differentiating between the two deficiencies. An N to S ratio of 17 in whole plant tissues is generally used for diagnosing sulfur deficient triticale. Sulfur

deficient triticale has also been known to contain high nitrate nitrogen (N03-N) concentrations.

MICRONUTRIENTS
Micronutrients have not been shown to be limiting triticale production and "shotgun" application of micronutrient mixtures containing boron (B), manganese (Mn), iron (Fe) and copper (Cu) "for insurance" have not been shown to be responsive and are not suggested.
GENERAL COMMENTS
Avoid a heavy first irrigation on spring cereals to prevent water logging, reduced tillering and N leaching.

Wheat, Spring, S-ID, Irrigated
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SOIL SAMPLING
Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.
SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.
GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.
THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO3-N) and (NH4-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF

SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Adequate N is necessary for maximum production of irrigated spring wheat. The amount of fertilizer N required to produce the maximum economic return depends on many factors. These factors include the yield estimate, amount of inorganic N remaining from the previous crop, mineralizable N, other N sources, and the previous crop residues.

TOTAL N REQUIREMENTS BASED ON ESTIMATED YIELD - Fertilizer N rates should correspond to the yield growers can reasonably expect for their soil conditions and management. Historical yields for a specific field or area will generally provide a fair approximation of yield potential, given the grower's traditional crop management. Projected changes in crop management (water management, variety, lodging control, disease and weed control) designed to appreciably increase or reduce production may require adjustment of yield estimates. Areas of fields known to differ considerably in yield, based on previous long-term observations or yield mapping, may also require adjustment of the total N required. The available N from all sources required to produce a bushel (60 pounds) of irrigated spring wheat depends on several crop management practices. Factors such as weed, insect, and disease control as well as irrigation, planting date, water management, and soil type can influence the N required for maximum yield. Results of field trials suggest that two pounds of available N per bushel are required for irrigated spring wheat ranging in yield from 80 to 120 bushels (bu) per acre. Nitrogen requirements per bushel may be greater for yields below 80 bu per acre, but less than two pounds N per bu for yields above 120 bu per acre.

AVAILABLE NITROGEN - Available nitrogen in the soil includes inorganic N measured as nitrate (NO_3-N) and ammonium (NH_4-N), mineralizable N (released from organic matter during the growing season), N credits from previous cropping or manures, and in some cases the N in irrigation water. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

INORGANIC NITROGEN - Residual soil inorganic nitrogen (NO3, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Research indicates that soil test inorganic N is used as effectively as fertilizer N. Ammonium N (NH4-N) is generally low in spring preplant soil samples and thus contributes little to available N. However, NH4-N should be determined along with NO3-N when there is reason to expect appreciable NH4-N from previous ammonium N fertilizer applications. To convert soil test NO3-N and NH4-N values to pounds (lb) N per acre, sum the N expressed in parts per million (ppm) for each foot increment of sampling depth and multiply times four. A preplant soil sample is often only collected from the first foot of soil. Although this information is not as complete and reliable as would be provided by deeper sampling, residual N measurements from the first foot of soil can be combined with estimates of residual N in the second foot to predict N requirements for irrigated spring wheat. Preplant soil test NO3-N in the second foot of the soil is commonly only one-half to two-thirds as high as in the first foot of soil, unless previous crop irrigation or over winter precipitation has leached N from the surface foot. Basing N rates on estimates rather than actual measurements of residual N in the second foot increases the risk of recommending either too little or too much N.

NITROGEN FROM PREVIOUS CROP RESIDUE - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of residue returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, (Wheat Straw Management and Nitrogen Fertilizer Requirements). Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of spring wheat. Sweet corn residues typically are higher in N content than mature field corn residues. In addition, they are returned to the soil earlier and decompose more rapidly, therefore releasing more N to subsequent spring wheat than mature corn stalks. Legume residues are typically rich in N and can release appreciable N for spring wheat. Bean and pea residues are fairly rapidly decomposed and the N release from them should be reflected in the preplant spring soil test for N. Alfalfa residues decompose less rapidly and the N release is not typically indicated by the preplant soil test.

MINERALIZED NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. Measurements of mineralizable N for spring cereals typically range from 30 to 60 lb per acre. Unless the capacity of a specific soil to release N is known, use a midpoint mineralizable N value of 45 lb N per acre for irrigated spring wheat. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, organic matter does not accurately predict the amount of N that is mineralized in southern Idaho irrigated soils.

NITROGEN FROM MANURE AND WATER - Fields used for spring wheat occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources can be appreciable and should be taken into consideration when estimating available N. Manures can vary in nutrient content depending on the animal source, how the manure is processed, and the quality and quantity of bedding material included. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content. For more detailed information on animal manures and their nutrient contributions to soils, refer to PNW 239, (How to Calculate Manure Application Rates in the Pacific Northwest). Irrigation waters other than lagoon effluents can also contain appreciable N. While most well and surface waters used for irrigation have low N concentrations, irrigation waters that receive appreciable return flows from other districts are likely to be higher in N. To convert the N content of each acre foot of irrigation water applied to the lb N per acre fertilizer equivalent, multiply the ppm or milligrams per liter (mg/l) N concentration by 2.7. Preplant applied N is easily leached beyond developing seedling root systems with early season irrigation. If early season irrigation is necessary to ensure proper vegetative development, consider reducing the time for each set. Set time can be lengthened as the root system develops more fully. Nitrogen located below the developing root system is not taken up as readily by the plant or used as effectively for yield.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, several available N components must be estimated: (1) total N needed for a given yield, (2)mineralized N, (3) inorganic N ($NO3 + NH4$) as measured by the soil test, (4) previous crop/residue management, and (5) manuring practice or irrigation water N concentration.

NITROGEN AND LODGING - Irrigated spring wheat is more susceptible to lodging at high available N levels than winter wheat. Lodging can reduce both grain yield and quality, as well as increase harvest costs. Varieties differ in straw strength, plant height, and their susceptibility to lodging. For descriptions of varieties and their susceptibility to lodging, refer to PR327, (2000 Idaho Certified Seed Selection Guide for Some Varieties of Spring Wheat). Ethephon (Cerone ®)is a growth regulator commonly used to shorten small grains, stiffen straw, and reduce lodging. Growers should consider using this growth regulator for wheat in soils with high available N if lodging is historically a problem.

MANAGING NITROGEN FOR HIGH PROTIEN HARD WHEAT - The hard wheat market, both red and white, often pays a premium for high protein. Hard spring wheat varieties can differ in grain protein. However, the most critical factor for producing high protein irrigated wheat is the amount and timing of N fertilization. To produce high protein wheat, first determine the total fertilizer N required to maximize yield. High protein generally is not realized unless available N matches or exceeds that required for maximum yield. The nitrogen applied for maximizing yield should be applied preplant. Split applications of N can increase wheat protein, but even split applied N may not raise protein to acceptable levels if the total N available is not sufficient for maximum yield. Between boot and flowering is the best time to influence grain protein with delayed applications. The optimum N rate for increasing protein to 14 percent may vary depending on the final yield. Higher yields increase and lower yields reduce the optimal delayed N rate. Flag leaf N testing can be useful for determining the need for later applied N. Research indicates that there is little protein increase with subsequent applied N when flag leaf total N concentration at heading is 4.2 to 4.3 percent or greater. The required N rate increases as flag leaf N values decrease below the critical value. If flag leaf N at heading is above 3.8 percent, no more than 40 lb N per acre should be needed to increase protein to 14 percent. If flag leaf N is below 3.8 percent, higher N rates may be needed.

PHOSPHORUS (P)

Irrigated spring wheat requires adequate soil P for maximum economic yields. Soil testing for P provides a reasonable estimate of available P. Optimum P fertilizer rates depend on both soil test P and soil lime content. Plant maturity may be delayed when soil test P concentrations are low and free lime content is greater than 10 percent. However, grain yields are usually unaffected when the growing season is sufficient. When banding an ammonium P source (11-52-0) at rates above 20 lb per acre, separate the seed and the fertilizer material by two inches to avoid seedling damage from salts. For a detailed discussion of banding refer to PNW 283, (No-Till and Minimum Tillage Farming: Fertilizer Band Location for Cereal Root Access). Incorporate P fertilizer during seedbed preparation. Solution P, such as ammonium polyphosphate, may be applied through a sprinkler irrigation system. Check the compatibility of the irrigation water and the P material. If precipitates form, decrease the fertilizer concentration or increase the injection time.

POTASSIUM (K) AND CHLORIDE (Cl)
Soil test K is a reasonable indication of available K in southern Idaho soils. Incorporate K during seedbed preparation. Potassium chloride increases yields where take-all root rot is prevalent, regardless of the soil test K level. This response is due primarily to the chloride component. Wheat yield may also increase when not infected with take-all if extractable soil Cl is below 30 lb per acre in the first two feet. Low soil Cl has been associated with physiological leaf spot. Soil Cl can be measured with a soil test. If soil test Cl is less than 8 ppm for the first two feet combined, apply 40 lb Cl per acre in the form of potassium chloride. Do not drill band Cl with the seed as germinating seed may be injured by excessive salts.

SULFUR (S)
Sulfur fertilizer requirements for spring wheat depend primarily on the S content of irrigation water and the S soil test. Coarse-textured soils are more likely to be low in S than fine-textured soils. Wheat irrigated with Snake River water or waters consisting of significant runoff from other fields should not require fertilizer S. Soils should be tested for S to a depth of two feet as the available form of S, or sulfate, is mobile. Soils low in S (less than 35 lb per acre in the 0-to 24-inch depth) should receive 20 to 40 lb of S per acre. Use S fertilizers containing readily available sulfate rather than elemental S to rapidly correct S shortages.

MICRONUTRIENTS
Spring wheat yield responses to iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), and other micronutrients are rarely observed in southern Idaho. Micronutrient applications may be needed occasionally on severely scraped or eroded areas.
Contact your County Extension Agent if you have any questions regarding the interpretation of this information or for further information on your local needs.

The above fertilizer guidelines are based on relationships established between University of Idaho soil test and crop yield response research. In this research, crop response to fertilizers was evaluated at several sites where the response to fertilizer differed. The recommendations reflect the general or overall response to fertilizers at specific soil test values and the response in individual fields can differ appreciably from the general table recommendation. Some sites will require less than the general recommendation, other sites more. Unfortunately, the science has not developed to the point where the table recommendations can account for all the unknown variables influencing the effectiveness of applied fertilizers at individual sites. The table fertilizer recommendations can only be used as general guides rather than specific recommendations for each and every field.

Furthermore, soil variability can sharply reduce the accuracy composite soil test values for individual fields. That is why large contiguous areas within fields should be sampled separately when they are known to differ in crop growth or soil characteristics known to influence the response to fertilizer. But soil variability frequently does not occur conveniently in large areas that can be sampled separately or fertilized differently. The fertilizer recommendations in most cases do not account for this variability. Soil test based recommendations may be excessive in some field areas and inadequate in other areas of the same field. The recommendations then will be appropriate only to the degree that the composite soil test values for fields actually represent the field. Thus, for fields that are highly variable, the fertilizer recommendations should be considered conservative estimates of fertilizers needed. All the more reason to consider the table fertilizer recommendations as general guides rather than specific recommendations for each and every field.

The fertilizer rates suggested in the tables will support above average yields if other factors are not limiting production. Therefore the recommendations assume that good crop management practices will be used, i.e. insect, disease, and weed control. Nutrient requirements can be met using either commercial fertilizers or equivalent organic matter sources, such as manure or compost, provided their nutrient content and relative availability are known or can be estimated from published literature. Soil test based recommended rates will not be appropriate if the soil samples are improperly taken or do not represent the area to be fertilized. For nitrogen in particular, recommendations will be most accurate when crop history is taken into account and projected yields are reasonable estimates based on long term records.

General Comments:

- Over irrigation and nutrient loss is a hazard. Optimum irrigation management is necessary to meet crop water use needs and avoid loss of nutrients through leaching beyond the root zone and runoff with irrigation tail water.

- Nitrogen leaching is particularly a concern on sandy soils.Optimum management may require split Nitrogen applications to meet crop needs.

- Weed, insect, and disease control significantly influence the efficiency and effectiveness of your fertilizer applications and ultimately crop yield and farm profitability.

- Phosphorus, potassium, and zinc nutrients can be effectively fall-applied as they are not readily leached over winter.

- Phosphorus can be budgeted for a crop rotation.

• If you have questions regarding the interpretation of this information, please contact your Extension Agricultural agent, Crop consultant, or your commodity company fieldman.

• Both farm profitability and water quality can be improved with efficient nutrient use. The following are recommendations in nutrient management, which will optimize nutrient use for crop production while protecting water quality:

1) Avoid the application of nutrient sources in close proximity to streams, wetlands, drainage ditches, areas of very shallow soils, and sinkholes.

2) Accurately calibrate nutrient application equipment to insure that recommended rates are applied.

3) Nitrogen recommendations for many crops are based on yield goals for the crops. It is important to establish realistic yield goals for each field based upon historical yield data, county averages, and your management practices to avoid unnecessary fertilizer costs and minimize potential water quality impairments.

Appendix D: SOIL TEST DATA

Field: No Data **Date of Test:** No Data

Parameter	Units	0-12"	12-24"	18-24"
Soil Texture		No Data	No Data	
EC	mmhos	No Data	No Data	
PH		No Data	No Data	
%Lime	%	No Data	No Data	
OM	%	No Data	No Data	
CEC	meq	No Data	No Data	
Nitrate-N	ppm	No Data	No Data	
Ammonia-N	ppm	No Data	No Data	

P	ppm	No Data	No Data	No Data
K	ppm	No Data	No Data	
Z	ppm	No Data	No Data	
Mn	ppm	No Data	No Data	
Fe	ppm	No Data	No Data	
Cu	ppm	No Data	No Data	
Ca	ppm	No Data	No Data	
Mg	ppm	No Data	No Data	
Na	ppm	No Data	No Data	